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PALAEOESKIMO CULTURAL TRANSITION: A CASE STUDY FROM IVUJIVIK, EASTERN ARCTIC

by

Murielle Ida Nagy ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment
of the requirements for the degree of Doctor of Philosophy

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This thesis is dedicated
to the memory of
Tivi Paningayak and
William E. Taylor, Jr.

ABSTRACT

This thesis is about the Pre-Dorset to Dorset transition, which is thought to have taken place around 2800 to 2600 B.P. in the Eastern Arctic. Three questions led the research. First, what are the cultural diffrences between the Pre-Dorset and the Dorset periods? Second, how can the differences in the archaeological record be interpreted? And third, is the concept of a Pre-Dorset/Dorset transition a valid one? To answer these questions, cultural elements that have been associated with the Pre-Dorset/Dorset transition in the literature were compared to those from five sites occupied from the Pre-Dorset to the Dorset periods in the Ivujivik area of the Eastern Arctic.

The archaeological evidence suggests that around 4000 to 3000 years B.P., small groups of Pre-Dorset people started to occupy the Ivujivik peninsula for short periods of time. They left behind sites with few artifacts associated with the remains of tent rings. Around 2800 years B.P., the descendants of the Pre-Dorset people started to use the Ivujivik area more intensively. After occupying the territory in a highly nomadic and rather exploratory manner during the Pre-Dorset period, people were now coming back year after year to the same hunting grounds. This was a new adaptation based on the exploitation of the territory according to the availability of animals at specific seasons. On the Ivujivik peninsula people mainly hunted seals during the spring and accumulated food surpluses for later use. They also started to use a wider range of lithic sources and made changes in their use of technology. It is argued that it was the accumulation of traditional knowledge of their environment that allowed people to transform their land-use system.

At this point in our knowledge of Arctic archaeology, the Pre-Dorset/Dorset transition is a workable concept. It is useful precisely for those sites which show a mixture of Pre-Dorset and Dorset materials and where it is impossible to isolate single occupations. When reused sites inhabited during the transition are compared with those occupied before and after them, gradual changes can be identified in the technology, subsistence, and habitation structures of their occupants.

RÉSUMÉ

Cette thèse porte sur la période dite de transition entre le Pré-Dorsétien et le Dorsétien, et qui eut lieu entre 2800 et 2600 ans avant le présent dans l'Arctique oriental. Trois questions ont mené la recherche. D'abord, quelles furent les différences culturelles entre les deux périodes? Ensuite, comment ces différences peuvent être interprétées? Enfin, est-ce que le concept de transition entre le Pré-Dorsétien et le Dorsétien est valide? Pour répondre à ces questions, les éléments culturels associés avec la transition que l'on mentionne dans la littérature furent comparés avec ceux de cinq sites occupés du Pré-Dorsétien et le Dorsétien dans la région d'Ivujivik de l'Arctique oriental.

Les vestiges archéologiques suggèrent qu'autour de 4000 à 3000 ans avant le présent, de petits groupes de Pré-Dorsétiens occupèrent la péninsule d'Ivujivik pour de courtes durées. Ils laissèrent des sites avec peu d'artefacts associés à des restes de tentes. À partir de 2800 ans avant le présent, les descendants des Pré-Dorsétiens commencèrent à utiliser la région d'Ivujivik de façon plus intensive. Après avoir occupés le territoire de manière plutôt exploratoire durant le Pré-Dorsétien, ces groupes de chasseurs nomades se mirent à retourner chaque année aux mêmes lieux de chasse. Il s'agissait d'une nouvelle adaptation basée sur l'exploitation saisonnière du territoire. À Ivujivik, les chasseurs privilégièrent la chasse aux phoques durant le printemps et entreposèrent des réserves de nourriture. Ils exploitèrent aussi une plus grande variété de matières premières et firent des changements dans l'utilisation de leur technologie. Ce serait l'accumulation de connaissances traditionnelles qui aurait permis la transformation du système d'utilisation du territoire.

Dans l'état actuel des connaissances en archéologie de l'Arctique, la transition entre le Pré-Dorsétien et le Dorsétien est un concept fort utile. Il l'est précisément pour les sites qui contiennent un mélange d'éléments pré-dorsétiens et dorsétiens et parmi lesquels on ne peut isoler des occupations uniques. Lorsque des sites réutilisés sont comparés à ceux occupés avant et après eux, on peut voir des changements graduels dans la technologie, les modes de subsistance et les structures d'habitation des occupants de ces sites.

PREFACE

At the end of my first summer of archaeological work in Ivujivik for the Avataq Cultural Institute, Inuk elder and field assistant Tivi Paningayak asked me to come back and do more archaeology with him before he died. I was extremely touched by his request and promised to come back. Then, I had to find a "research question" to convince my thesis supervisor, various granting agencies, and the administration of the village of Ivujivik, to help me go back to Ivujivik.

In term of archaeological sites, I had been very impressed by their high numbers and the richness of archaeological remains associated with them. As I wrote the report on the salvage excavation of the Ohituk site, I became suspicious that I was dealing with something other than an early Dorset site as indicated by the presence of a harpoon head from that time period. In effect, other lithic tools were more similar to those found in Pre-Dorset sites. Although I concluded that there were two distinct occupation levels (one Pre-Dorset and one Dorset), I hoped to do more spatial analysis with the material to confirm if indeed it was the case.

I also started to wonder if the Ohituk site had been occupied during a period of cultural changes that could be reflected in the use of different tool types, raw material, and faunal resources by its inhabitants. As I wrote research proposals I decided to focus on the cultural changes from sites occupied in Ivujivik during different palaeoeskimo periods. After the third summer of excavations which took place at the Pita site, I became quite frustrated while trying to attribute a cultural affiliation to the site. The Pita site had been identified as Pre-Dorset by archaeologist Bill Taylor. Although we found many lithic tools from that time period, we also recovered tools which resembled those from the Dorset period. By that time, I became convinced that I was dealing with a site that had been occupied during a period of cultural transition and this was why the material looked mixed from different periods of occupation.

My intuition was confirmed by radiocarbon dates that placed both the Ohituk and the Pita sites during the so-called Pre-Dorset/Dorset transition. The dates however did not answer all the questions that were now coming to my mind, such as "what do archaeologists mean by the term cultural transition?" or "How could a cultural transition be recognized among the remains of an archaeological site?" I now had enough cultural and faunal material from five sites to compare them and look for possible patterns within and between the sites. Furthermore, if sites associated within a cultural transition were indeed identifiable, I would still need to understand and later explain why and how the changes happened. Somehow, I also hoped to be able to challenge the explanation traditionally used by archaeologists that links cultural changes to climatic ones.

As with most people, my own experiences in life have influenced my way of thinking about the world and thus affected the kinds of explanations I would favour. Over the last eight years, and in parallel to my Ph.D. studies, I also worked as a consultant in anthropology on oral history projects for the Inuvialuit of the western Canadian Arctic. The more I worked with Inuvialuit elders and read translations from their interviews, the more I realized how knowledge of the land was important to them not only for survival skills, but for their perception of who they were. People associated themselves with the area where they lived and even with specific camp sites where they went back every year.

The Inuvialuit elders I worked with told me how their life was when they were still living off the land. To my surprise they were not the wandering nomads I had imagined them to be. They knew where they were going and why they were going somewhere. People had an intimate knowledge of the land and its resources; toponyms were often used as mnemonic devices to learn and remember what was specific to each place. Some of these place names were used to refer to resources such as caribou, fish, or berries, while others could warn people about events that happened there. I have been amazed by the numerous place names some people knew from vast areas where they travelled and lived. Traditional knowledge passed on from generation to generation allowed people to plan their travels and to exploit the land depending on the seasons. The more people used the land, the more they kept and accumulated knowledge.

I also realized that knowledge of the land could easily be lost within one generation if people stopped utilizing their territory. Even the toponyms and their associated stories would slowly be forgotten. Younger people were not sure where a place name was or where a story happened because they had never been there. I began to wonder how long it took for the first people who occupied the Arctic to accumulate enough knowledge to identify themselves with specific places, to have a sense of "belonging there". I do not mean that these people were maladapted to the arctic environment. They would have needed the cultural background associated with those who live in the arctic environment. I am talking about a more intimate knowledge of the land that differentiate people travelling through the land from those living there. Thus, when people started to migrate throughout the Arctic during the Pre-Dorset period, they must have had a "newcomer" mentality where the land was new and the predictability of resources had not been learned from years of exploiting a specific region.

Furthermore, being an archaeologist trained in the 1980s when the ideas of Lewis Binford were most discussed during seminars on theory, I could not avoid the issues he had raised concerning the formation of sites through the different logistical strategies employed by people. Using Binford's ideas, I anticipated that newcomers in the Arctic would exploit the land differently from those who had settled in specific areas (i.e. during the Dorset period). I also expected that the Pre-Dorset/Dorset transitional sites might have witnessed cultural transformations through the accumulation of traditional knowledge. Indeed, different patterns emerged once I completed the analyses of the archaeological and faunal material. In the following thesis I tell the story of what I learned from the archaeological data and how I used the idea of traditional knowledge to understand the process leading to cultural transitions.

The reader should note that when referring to dates I use both B.P. (Before Present) and B.C. (Before Christ). For consistency purposes I should have used one or the other. However, I am often quoting dates from authors that do not explain how their dates were obtained. I have thus decided to present the dates as I found them in the literature.

ACKNOWLEDGMENTS

In 1988, I was asked by archaeologist Ian Badgley to direct a salvage excavation in Ivujivik (Nunavik, Northern Québec) for the Avataq Cultural Institute. I accepted and for the next three summers, I had the privilege to work with wonderful people. So first, I want to thank all the people who worked with me on the excavations: Annie Ainalik, Mosesi Ainalik, Nutaaq Ainalik, Siaja Ainalik, Siqualuk Ainalik, Qautsaalik Alaku, Ali Audlaluk, Siasi Audlaluk, Robert Bilodeau, Pita Kristensen, Evie Luuku, Lisi Nauja, Maggie Naluiyuk, Tivi Paningayak, Qiyuk Qaunaaluk, Minnie Tuckatuck and Louisa Usuarguk. Thanks also to the volunteers Annie Ainalik, Suzie D'Ambroise, Carl Kristensen, Juanasi Mangiuk, Denis Roy, Ginette Savard and her son Joska, Tarqik Tarqik and Paul Valois.

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In 1988, the excavation was financed by the Ministère des Transports du Québec, while in 1989, by the Boreal Institute for Northern Studies, the Northern Science Training Program and the Ministère des Affaires Culturelles du Québec. In 1990, the project was funded by the Boreal Institute for Northern Studies, the Northern Science Training Program, the University of Alberta and a one year grant from the Fonds pour la Formation de Chercheurs et l'Aide à la Recherche. Field equipment was borrowed from the University of Alberta, the Avataq Cultural Institute, the Université du Québec à Chicoutimi, and Dr. Raymond Le Blanc. Analysis of the artifacts was made possible by a one year doctoral scholarship from the Conseil de la Recherche en Sciences Humaines du Canada. The Department of Anthropology at the University of Alberta graciously financed three radiocarbon dates and gave me access to great working spaces.

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CHAPTER 1
Introduction

Nature of the study

This thesis is about culture change and how Arctic archaeologists have described and explained what is called the Pre-Dorset to Dorset transition, during which cultural transformations are thought to have taken place in the Eastern Arctic. The Pre-Dorset/Dorset transition has been associated with sites dated between 2800 to 2600 B.P. However, recently published dates would place it over a longer period, between 2800-2100 B.P. and even as late as 1900 B.P., at least for Newfoundland (Renouf 1994). As will be seen, the very concept of transition is ill-defined and thereby misleading, not only in Arctic archaeology but in the archaeologies of other areas in the world.

The present study starts with a review of the literature on the Pre-Dorset/Dorset transition. It then presents propositions on how to define a cultural transition and address three questions. First, what were the cultural differences that occurred between the Pre-Dorset and the Dorset periods? Second, how can the differenes in the archaeological record be interpreted? And third, is the concept of a Pre-Dorset/Dorset transition a valid one?

To answer these questions, cultural elements that have been associated with the Pre-Dorset/Dorset transition in the literature were compared to those from five sites occupied from the Pre-Dorset to the Dorset periods in the Ivujivik area of the Eastern Arctic. Analyses of the artifact and faunal materials within and between sites were performed to identify assemblage variations and possible evidence of a transition in their use through time. A special emphasis was put on how different assemblages were created by the inhabitants of the sites and to decide if these assemblages can be interpreted as part of a cultural transition.

Palaeoeskimo archaeology

Over the last twenty years, two major criticisms have been leveled at Arctic archaeology. The first concerns the limitations of the culture-historical approach to explain, rather than describe, culture change (Dekin 1976; Bielawski 1983; Schindler 1985). The main argument expressed by Arctic archaeologists for using a culture-historical approach is the need to gather more data to integrate into a chronological framework before addressing explanatory questions (e.g., Auger 1986; Helmer 1991; McGhee 1979; Schledermann 1990; Taylor and McGhee 1979; Tuck and McGhee 1983). The second criticism concerns the confusing and inadequate conceptual jargon used by Arctic archaeologists (see criticisms by Elling 1992; Helmer 1987, 1994; McGhee 1982; Plumet 1982, 1987; Tuck and Fitzhugh 1986; Tuck and Ramsden 1990). When referring to Pre-Dorset and Dorset, for example, archaeologists use terms such as "culture", "period", "complex", "phase", "tradition" and "stage" in a rather cavalier manner.

Pre-Dorset and Dorset are terms used by Arctic archaeologists to distinguish between two chronological and cultural periods of a broader Palaeoeskimo culture known as the Arctic Small Tool tradition (ASTt). The term "Dorset" originated with a collection from Cape Dorset (Baffin Island) analyzed by Diamond Jenness (1925) in the 1920s. Originally working with three different collections, Jenness divided them into three chronological subdivisions, one of which he called the Cape Dorset complex. He thought that the latter preceded the Thule culture, an insightful deduction subsequently verified through radiocarbon dating of Dorset and Thule sites. We now know that Dorset material dates from about 600 B.C. to A.D. 1000 (Maxwell 1976, 1985). As the name indicates, "Pre-Dorset" material is older then Dorset and is thought to be the cultural progenitor of Dorset. Radiocarbon dates associated with Pre-Dorset material (and its regional variants Independence I and Saqqaq in the High Arctic and Greenland) range from about 2000 to 800 B.C.

Other problems concern the methods and theories used in Palaeoeskimo archaeology. In her discussion of such issues, Bielawski (1988:72) concludes that "neither general evolutionary nor cultural ecological theory seem specific nor strong enough at present to order the data, much less to explain them." She argued further that if stylistic types are assigned appropriate historical meaning, then interpretation based on historical particularism need not be rejected in favour of that based on systemic causation. However, despite the fact that Arctic archaeologists are well aware of the limitations inherent in the use of diagnostic artifacts to establish chronological control of their collections (see McGhee 1983), they still rely almost exclusively on interpretations based upon analysis of distinct artifact styles. As Elling (1992:2) noted in the context of Greenland archaeology, "culture classificatory terminology holds a danger of turning into doctrines that predefine the structure in which new archaeological results have to fit." A good example of the lack of consistency associated with the identification of cultural affiliation of Palaeoeskimo sites can be found in the so-called "Pre-Dorset/Dorset Transition." The identification of Pre-Dorset/Dorset transitional sites is far from obvious, and it can be asked whether substantial cultural changes really took place at all between the Pre-Dorset and the Dorset periods.

The distribution of Pre-Dorset sites in the Eastern and Central Arctic extends from central Labrador north along the coast of eastern Baffin Island and to the northwestern corner of Devon Island. Sites are also located along both shores of the Hudson Strait, Mansel Island, and on the eastern and western coasts of Hudson Bay (Maxwell 1984:360).

Dorset sites are mostly found along the coasts of Hudson Bay, Hudson Strait and those of Fury and Hecla Straits (McGhee 1976:15).

The lithic technology of Pre-Dorset people suggests that tools like burins and small sidescrapers were used in fabricating ivory, bone and antler objects. Stemmed and side-notched knives were probably used for cutting wood or meat. Ground slate knives, which are not found in all sites, would have been used to separate blubber from carcasses or to work wood. Chert drills, microblades, retouched burin spall awls, bone awls and ivory needles (with small round eyes and a blunt butt end) indicate activities linked to the manufacture of clothes and of other objects made of skin. Soapstone lamps, which are small oval or round bowls for burning seal fat, are part of the Pre-Dorset lithic industry but are quite rare.

Habitation structures of Pre-Dorset people were small oval tents for the warm season and small bi-lobal structures with mid-passage probably used for the colder months (Maxwell 1984, 1985). The economy of Pre-Dorset people was based on the exploitation of sea mammal (mostly seal and walrus) and land mammal species (caribou, musk-ox, polar bear).

The majority of cultural traits found during the Pre-Dorset period persist in the Dorset period with only slight stylistic variation, but dogs, bows and arrows, and drills apparently disappear from the cultural inventory (Maxwell 1984:364). In order to distinguish the emergence of Dorset assemblages, Maxwell (1985:123) and Schledermann (1990:166-167) have noted the following patterns in the lithic material:

(1) an increase in triangular projectile points, often with fluting at the distal tips;
(2) the appearance of an extensive ground slate industry, with multiple side-notched knives;
(3) the appearance of multiple side-notched chert endblades;
(4) the appearance of rectangular soapstone vessels;
(5) an increase in two varieties of burin-like tools;
(6) the proliferation of microblades;
(7) an increase in the use of nephrite, quartz crystal and other scarce stone resources.

Bone and ivory needles now have oval eyes with sharpened butt ends. The art work from Dorset sites is extremely rich in comparison to that found in Pre-Dorset sites. With the beginning of Dorset, bone sled shoes, snow knives for snowhouse building and ice creepers of antler or ivory make their appearance. The presence of such winter-related artifacts, and a proportional increase in stone lamps found in Dorset sites, has been interpreted as an increase in sea-ice hunting (Maxwell 1984, 1985). Through a series of intermediate steps, the style of harpoon heads changes from an open socket to a closed one.

Habitation structures of Dorset people were circular or rectangular summer tents supported by large boulders, and rectangular or oval semi-subterranean sod houses for the winter (Maxwell 1985:123). The economy of Dorset people is believed to have focused more on sea mammal resources (particularly seals) than during the preceding period.

The Pre-Dorset/Dorset transition

Although the terms Pre-Dorset and Dorset are well entrenched in Arctic archaeological literature, the transition between these two periods is poorly known and problematical. It has been said (e.g., Maxwell 1984, 1985) that many cultural traits emerged while others disappeared during the transition from Pre-Dorset to Dorset, from about 800 to 500 B.C. The causes of such cultural transformations have been mostly linked to environmental changes, leading to new technological and economic adaptations of the later Dorset people (e.g., Maxwell 1985; McGhee 1988).

The transitional period has been given different names according to geographical region where it was first found. In northern Greenland and the High Arctic, this period is usually called "Independence II" (see Knuth 1968; McGhee 1981), but recently has been referred to as transitional (Helmer 1991, Schledermann 1990). In western Greenland, the dates of the "late Saqqaq" and "Dorset I" periods fall within the transitional period (see Møbjerg 1986, 1988). Sites have been identified as belonging to the transitional period on the southeastern coast of Baffin Island (Maxwell 1985:111) and on the east coast of Hudson Bay (Nagy 1994a). West of Ungava Bay, sites of the same time range are associated with the Groswater complex (e.g., Gendron 1990, Plumet 1994), which was originally described for the Labrador Coast (Fitzhugh 1972, 1976, 1980). Groswater is also used for sites from the transitional period found on the Eastern Lower North Shore of Québec (Pintal 1994) and in Newfoundland (Auger 1986; Pintal 1994; Renouf 1993, 1994; Tuck and Fitzhugh 1986).

Despite the fact that Pre-Dorset and Dorset periods have been contrasted in terms of structural remains, tool styles, use of different raw materials and subsistence patterns (e.g., Maxwell 1985; McGhee 1978), the definition of the transitional period is less clear. Unless sites are thought to be disturbed through reoccupation, those sites containing traits from both Pre-Dorset and Dorset periods are identified as transitional ones. However, since the differences in material culture are not extreme, and because dating of sites is often lacking, archaeologists seem to rely primarily on subjective criteria to identify what they call "Late Pre-Dorset", "Transitional" and "Early Dorset" sites. As Park (1992:122) noted about Schledermann's (1990) distinction between "Transitional" and "Early Dorset" sites on

Ellesmere Island: "the categorization appears to have been largely intuitive on Schledermann's part."

Causal explanations for the Pre-Dorset/Dorset transition

Explanations of the causes of cultural changes between Pre-Dorset and Dorset periods have been diverse. The most common interpretation is that economic and technological changes gave rise to the Dorset period. However, archaeologists have different opinions on the cause of these cultural changes. Fitzhugh (1972, 1976) postulates that it was a time of human adjustments to a diminution of caribou herds. McGhee (1981) suggests a population decline in the Eastern Arctic around 1000 B.C. followed by a population expansion at the beginning of the Dorset culture. Maxwell (1976, 1985) sees the Dorset culture as the merging of two lifeways (land mammal hunting and sea mammal hunting) that were in state of relative equilibrium. Another possibility, although less explored, is that some aspects of the Dorset culture were originally influenced from the Western Arctic (see Arnold 1981, Taylor 1968:101).

Most explanations are based on the premise that there was a change in the environment. Climatic changes affected the existing culture, which in turn had to adapt in order to survive (Maxwell 1985; Møbjerg 1986; Schledermann 1990). According to Maxwell (1985:107), the climate of the Pre-Dorset period was warmer than during the Dorset period. However, the period between 1300 and 500 B.C., that is during the transition, was one of cooling and unstable climates (Maxwell 1985:34). Using recent literature on palaeoclimates of the Eastern and High Arctic, Renouf (1993:205) also describes cold and unstable conditions beginning around 3000 to 2200 B.P. and reaching a cold peak between 2600 to 2500 B.P. Renouf (1993:207) postulates that if unpredictability of sea mammals was the norm for the period from about 3000 to 2000 B.P., people had to adapt to the challenge. She proposes two strategies which according to her, complement each other. The first strategy was to generalize rather than specialize the subsistence base. The second was to keep the living group size small, to allow easy moves to resources. Renouf expects that these two strategies would leave small archaeological sites with little cultural deposit. With climate warming starting at around 2200 B.P., there emerged what has been called the Dorset culture. The sites left by the Dorset people show a more intensive use of sea mammals and thus reflect a new adaptation that was no longer linked to resource instability (Renouf 1993:207).

As we have seen, the Pre-Dorset and Dorset periods could be interpreted as elements of a relatively stable system that was punctuated by a period of change identified as the "transitional period." By contrast, it is also possible that this period reflects only one chronological segment, without important cultural changes, in a Palaeoeskimo continuum. Some of the stylistic differences that have been observed between Pre-Dorset and Dorset collections may be only functional ones, and what has been attributed to cultural change could be explained by the remains of specific activities occurring within one site (see Binford and Binford 1966; Dunnel 1978; Sackett 1986). It is also possible that the presence of cultural traits belonging to the two periods at any specific site are the result of the reoccupation of a Pre-Dorset site during the Dorset period. This interpretation was taken by Møbjerg (1986) with material from Saqqaq and Dorset I complexes in Greenland. In sites where archaeological specimens from both complexes were found, she assumed that the Saqqaq sites had been reoccupied by Dorset people. The possibility that these sites might be transitional was proposed by Møbjerg (1986:51) for only one case.

Cultural continuum or cultural replacement?

To appreciate how archaeologists perceive the nature of the transition between the Pre-Dorset and the Dorset periods it is necessary to go back to the research concerning the origins of the Dorset culture. In the 1950s, Larsen and Melgaard (1958) published a study on cultural material from Saqqaq and Dorset sites in Greenland. They interpreted the chronological gap between these sites as an abandonment of sites by Saqqaq people due to climatic changes followed by a reoccupation by later Dorset people. Taylor (1968) subsequently argued for a transformation of Saqqaq into Dorset, but discontinuity is still favoured by archaeologists working in Greenland (e.g., Grønnow 1994). Furthermore, based on his work in Igloolik, Melgaard (1960, 1962) suggested that abrupt cultural changes occurred between late Pre-Dorset (that he then called "Sarqaq") and early Dorset. In Melgaard's view, Dorset people had southern connections (i.e., from a forested zone) and were new migrants to the area previously occupied by the Pre-Dorset. The southern connections were strongly contested by Harp (1964) and particularly by Taylor (1968) who saw more links between Pre-Dorset and Dorset cultural material.

Taylor's ideas derived from his own research in Northern Québec during the late 1950s when he excavated archaeological sites on Mansel Island, Ivujivik and Sugluk (Salluit). The results of this work can be found in several published articles (Taylor 1958, 1959a, 1959b, 1960, 1962a) and especially in a study of the origins of the Dorset culture published in 1968. Taylor's conclusions were as follows: there is a cultural continuity from Pre-Dorset to Dorset in the Canadian Eastern Arctic and, within this area, the Dorset culture developed *in situ*. Although Taylor's 1968 study compared material from only two sites, his conclusions are still accepted by most Arctic archaeologists.

Some researchers think that the Dorset culture developed locally and simultaneously throughout the Eastern Arctic (Maxwell 1985:121-125). Others prefer an explanation based upon diffusion from a so-called "core area," a rough circle of some 1,000 km diameter including the coasts of Fury and Hecla Straits, Hudson Bay and Hudson Strait (McGhee 1976:15). However, there is no consensus on the nature and direction of such diffusion. Schledermann (1990:166) warns that "the transition cannot be conceived of as being smooth and uniform" and adds that, "although the core area played a major role in the Pre-Dorset/Dorset transition, the evidence from Labrador, southern Baffin Island and the Bache Peninsula region strongly indicates that the transition was considerably more complex and regionally distinctive than originally envisaged" (Schledermann 1990:325).

Despite a discourse that describes Pre-Dorset and Dorset as parts of a cultural continuum (Maxwell 1976, 1985), these two concepts are used primarily to contrast and accentuate cultural differences rather than to stress similarities between these two periods (on this issue see also Møbjerg 1988; Plumet 1987). As noted by Møbjerg (1986:21), discontinuities might be a consequence of limited research in some areas. Furthermore, opinions differ on whether transitional assemblages are more similar to Pre-Dorset or to Dorset material. For example, Cox (1978:104) described the "Terminal Pre-Dorset/Groswater Dorset" as a "transitional stage" that is "essentially the final stage of Pre-Dorset cultural evolution in Labrador." Such a view is shared by Pintal (1994) who excavated Groswater material from the eastern Lower North Shore of Québec. Recently, Tuck and Ramsden (1990) have argued that Early Dorset (which they group along with Groswater and Independence II complexes) is in fact the end of the Pre-Dorset continuum. On the other hand, working on material from Devon Island in High Arctic, Helmer (1994) linked the transitional "horizon" under the "cultural tradition" of the Dorset culture. Such contrasting views raise the question of whether archaeologists' perceptions of cultural transition are influenced by regional variability in material culture.

As I have just indicated, archaeologists distinguish two complexes (or "traditions") in this transitional period, Independence II and Groswater, both having dates that overlap with the beginning of the Dorset period. Independence II sites are located in Greenland and the High Arctic while Groswater sites were originally found in Labrador and Newfoundland, but have also been found west of Ungava Bay in Northern Québec (Gendron 1990; Plumet 1994). Groswater occupations seem to be perceived by archaeologists as a distinct cultural entity that disappeared shortly after the arrival of an Early Dorset population around 2500 BP, but which persisted on the Labrador coast until 2200 BP (Cox 1978:104; Fitzhugh 1976; Tuck 1975, 1976). However, it remains unclear whether the Independence II and Groswater complexes are ancestral to the Dorset culture or independent and unrelated (e.g., Auger 1986; Cox 1978).

In a recent critique on the classification of Palaeoeskimo cultures in Greenland, Elling (1992:1) insisted that the "Independence II group must be seen as an Early Dorset phase/Late Pre-Dorset phase adapted to the environmental conditions of Northern Greenland," thus stressing the transitional nature of the such material. In contrast, Tuck and Fitzhugh (1986) have argued that the designation of Groswater "traditions" should be extended to a number of sites previously termed "Early Dorset" in Newfoundland and that these are more closely related to the Late Pre-Dorset than to the Early Dorset. If this is the case, Hood's (1986) conclusions on the similarities between Groswater and Early Dorset habitation structures from the Nain Region in Labrador should be interpreted as continuity *within* Pre-Dorset but *not* with Dorset.

Other archaeologists have expressed doubts about the cultural continuity between Pre-Dorset and Dorset material. In western Greenland, the change from Saqqaq to Dorset is still problematic (see Møbjerg 1986). The gap in dates between the end of Saqqaq (2700 B.P.) and the beginning of Dorset (i.e., Dorset I at 2400 B.P.) convinced Grønnow (1994) that there was discontinuity between the two cultures. His argument was also based on the stratigraphy of several sites that show a break between Saqqaq and Dorset I layers. Working on archaeological sites from Port au Choix on the west shore of Newfoundland, Renouf (1993, 1994) questioned the continuity between the Groswater and Dorset periods on the island. She points out that there are differences in implements and structures, but most importantly, in terms of adaptation. In effect, she interpreted Groswater sites as short-term occupations with few people gathering for the specific purpose of seal hunting. In contrast, Dorset sites represent longer-term occupations by more people focusing on sea mammal hunting (Renouf 1993: 201).

In Labrador, Loring and Cox (1986) placed the "Late Groswater" lithic assemblages of Kaipokok Bay as transitional between Pre-Dorset and Dorset forms. They even found technological and stylistic similarities between the burin-like tools of their Groswater assemblages with those of Early Dorset sites from Southampton Island. However, despite their discussion of such similarities, they insisted that Early Dorset occupations on the north Labrador coast were the result of a new population in Labrador and not an *in situ* development from Groswater ancestry. Their argument was that there were significant changes in the subsistence-settlement and technological systems of Early Dorset people, and because Groswater remained on the central coast of Labrador while it had been replaced by Early Dorset on the north coast.

Tuck and Ramsden (1990) have recently challenged what they called the "Taylor-made" solution to cultural continuity between Pre-Dorset and Dorset cultures. They concluded that such continuity can only be found between Pre-Dorset and Early Dorset. They also noted that the use of "Early Dorset" is misleading since it implies further continuity with the Middle and Late Dorset, for which they felt evidence was lacking. According to them, cultural changes started only with the Middle Dorset at about 500 B.C. If such is the case, there is no need to talk about a "Pre-Dorset/Dorset transition" but rather about an "Early Dorset/Middle Dorset transition." Or, if one follows their argument that Early Dorset is actually Late Pre-Dorset (see also Tuck and Fitzhugh 1986) and Middle Dorset is in fact Dorset, then the "Pre-Dorset/Dorset transition" happened later than originally proposed. However, if there is no cultural continuity between Early Dorset and Middle Dorset, as they also argued, then the whole idea of Pre-Dorset/Dorset transition falls apart.

The cultural continuity between Pre-Dorset and Dorset culture might thus not be as valid as is often assumed (e.g., Plumet 1994:139). In short, the nature of the transition from Pre-Dorset to Dorset remains ambiguous. If archaeologists agree that Pre-Dorset and Dorset are part of the same cultural continuum, those terms should not be used with strong ethnic connotations (see Plumet 1987). The use of a term such as "transition" implies that there were cultural changes within the same culture. However, evidence of significant transformations within the so-called Pre-Dorset/Dorset transition has yet to be produced. Two important questions are still to be answered about this period: first, are we seeing continuity and gradual change, or is there a sharp cultural break in the technology and economy of people who lived in the Eastern Arctic around 800 to 500 B.C.?; and second, is there a distinctive archaeological signature that can be used to define transitional sites?

Problems with the Pre-Dorset/Dorset transition

Transitional sites have not been the focus of a systematic study in Palaeoeskimo archaeology. They are described in the archaeological literature more on an opportunistic basis (i.e., when they are found) rather than with an appropriate set of questions regarding their nature. As a result, problems with the data are often overlooked. For example, many Dorset sites have excellent preservation of organic material compared to the earlier Pre-Dorset sites. Such a difference in the state of organic material preservation has important repercussions in contrasting Pre-Dorset with Dorset periods and in identifying transitional sites. The trait list that Maxwell (1985:123) uses to distinguish the Dorset period from the preceding one includes the following organic materials: sled shoes and sled models; ice creepers; snow knives; and a rich, presumably shamanistic or magic-related, art. These artifacts are not found in Pre-Dorset sites. More intensive occupation of sites by the Dorset people leading to the development of frozen midden deposits of organic material and the presence of an active layer of permafrost during the Dorset period may be responsible for the preservation of artifacts which were, until then, not found in archaeological sites. It might very well be that the above mentioned items were used during the Pre-Dorset period but were simply not preserved.

The dating of transitional sites is another problem. In many cases, these sites are dated solely by reference to the types of artifacts they contain (e.g., Helmer 1991; Schledermann 1990). Transitional sites are generally dated between 800 and 500 B.C., but many of the published radiocarbon dates are problematic since they were obtained from samples containing sea mammal bones and/or burned fat. These may be contaminated due to the "reservoir effect" (see Arundale 1981; Morrison 1989; R. Taylor 1987) and should not be considered for dating purposes (McGhee and Tuck 1976; Tuck and McGhee 1983).

Driftwood is commonly used by geologists to date beach ridges in the Arctic and by archaeologists to date sites. In his reconstruction of the pattern of raised shoreline deformation in the area of Barrow Strait in the High Arctic, Dyke (1993:142) used mostly radiocarbon dates from driftwood and few dates from shells and whalebones. Both the driftwood and the shells were corrected for ^{13}C fractionation but not the whalebone dates. With the exception of two dates from shells, all the dates fitted well within the emergence curve that was produced, even the uncorrected whalebone. Morrison (1989) did not find serious discrepancies between radiocarbon dates from driftwood and those from other organic materials found in Thule sites. Although the age of driftwood is rarely called into question, radiocarbon dates obtained from driftwood should still be considered with caution. Indeed, it is impossible to determine the age of the wood when it started to travel the Arctic waters, how long it drifted, or how long it may have lain on a beach before being used by humans. Thus, once dated, a piece of driftwood already 200 years old when utilized by Palaeoeskimo people might be attributed a temporal affiliation with the Late Pre-Dorset period rather than with the Pre-Dorset/Dorset transition.

Another method used by Arctic archaeologists to assign ages to sites relies on the different elevations of the beach ridges on which sites are located (e.g., Bielawski 1988:64; Maxwell 1976:70, Melgaard 1960). Archaeologists assume that people chose to settle near the shore and that sites found on higher terraces should be older than those on lower ones. This, of course, is not always the case. For example, Harp (1976:120) has noted that in the Dorset site of Port au Choix, the oldest house was found on the lower terrace while the younger houses were found on the higher terrace. This, according to Harp (1976:120) represents "another apparent example of aboriginal disregard for cherished modern notions about beachridge dating." Taylor (1968:98-99) mentioned other ethnographic examples to caution archaeologists that "elevation sequence is a sharp tool that can cut the carpenter as easily as it does the wood." During my own field work in Ivujivik, I was told that one of the oldest Palaeoeskimo sites we were excavating and which was located on the highest elevation, had been occupied as recently as the 1920s (Tivi Paningayak, pers. com. 1990).

Another problem concerns the use of isostatic rebound rates for inferring site chronology (e.g., Badgley 1980; Clark and Fitzhugh 1992). The logic behind the argument is obvious: people could not have lived in an underwater location. However, many Arctic sites are located in regions where isotatic rebound has not been studied and where curves are constructed by extrapolating data from other areas.

Studying another transition

The Middle to Upper Palaeolithic transition has been one of the most studied and debated subjects in archaeology and a quick review of its recent literature can expand our views on how to study an archaeological transition. The interest in the Middle to Upper Palaeolithic transition is certainly linked to the fact that it involved no less than the replacement of the Neanderthals by *Homo sapiens sapiens* in Europe and changes in lithic technology (see Mellars 1989; White 1982). The transition occurred between c. 45,000 BP and 30,000 BP, which would seem quite a long time if compared to other archaeological transitions such as the Pre-Dorset/Dorset transition that roughly took 200 to 1000 years at the most. However, the cultural changes associated with the Middle to Upper Palaeolithic transition have been characterized as "rapid and abrupt" (e.g., Mellars 1989:353; Trinkaus 1989:42). Unfortunately, and as with many other archaeological studies, the archaeological evidence is mainly composed of lithic artifacts and its interpretation is thus very limited. As Marks (1990:59) commented:

> At best, such a lithic technological transition can only be one minor aspect of a changing adaptation and it is certainly questionable whether it, by itself, should be thought as a phase, beyond the very narrow view of a sequence of lithic assemblages.

A major problem associated with the study of the Middle to Upper Palaeolithic transition is that different lithic industries were often defined in relation to the relative frequencies of specific tool categories with little regard to the human activities that created them. Thus, what was once interpreted as assemblages from different cultural groups might have been the remains of the same cultural entity performing different activities. What first started as a "style versus function" debate between Binford and Binford (1966) and Bordes (1967, 1968) about Mousterian industries has since stimulated much research and new interpretations on the subject of the Middle to Upper Palaeolithic transition.

Binford (1982, 1989) now argues that the Middle to Upper Palaeolithic transition in Europe was one from earlier hominids to fully modern humans. According to him, Middle Palaeolithic hominids lacked the ability to organize themselves logistically or to plan hunting strategies (contra Henry et al. 1996). The Middle to Upper Palaeolithic transition reflects as a shift from foraging to collecting strategies, each adaptation resulting in specific archaeological sites (Binford 1982, 1989).

Technological approaches to the issue have also yielded interesting results. For example, Dibble (1987) has suggested that so-called stylistic differences in sidescrapers from Middle Palaeolithic assemblages represented different stages in a tool's reduction sequence through reuse and remodification.

The stereotype of the Upper Palaeolithic with increased typological complexity and innovation has been criticized because it cannot be substantiated when the final Mousterian and early Upper Palaeolithic are considered alone (Reynolds 1990:272-273). Even the identification of transitional assemblages was questioned by Harrold (1989:693), since classic transitional assemblages such as La Ferrassie E and Le Moustier K are now known to be artificial mixtures. Clark and Lindly (1989) rightly pointed out that the different classification schemes used to describe the Middle to Upper Palaeolithic emphasized typological differences at the expense of technological aspects. Thus, the Middle and Upper Palaeolithic were "artificially separated into two distinct conceptual units rather than viewed as points along a continuum of culture change" (Clark and Lindly 1989:633). They also added that comparison of "typical" Middle Palaeolithic with "typical" Upper Palaeolithic assemblages conceals variability within each period and downplays similarities between periods (Clark and Lindly 1989:634). Other researchers such as Otte (1990:444-447), have stressed the fact that the Middle to Upper Palaeolithic transition contains both discontinuities that indicate a rupture with the preceding period, and continuities, which are more transient or evolving elements from the precedent period.

Echoing the view of Clark and Lindly (1989) that comparisons between Middle and Upper Palaeolithic emphasized discontinuity, Simek and Price (1990) looked at lithic assemblage diversity in relation to chronological change to verify if there was indeed an increasing complexity during the Upper Palaeolithic. They concluded that there was no dramatic transition in assemblage diversity at the Middle to Upper Palaeolithic boundary (Simek and Price 1990:257). Using Binford's proposition (1982, 1989) that the Middle to Upper Palaeolithic transition involved a shift from foraging to collecting strategies, they proposed that faunal evidence might indicate changes in site composition. Indeed, Soffer 's (1989) study of the Middle to Upper Palaeolithic transition on the Russian Plain has shown that the change involved a switch from opportunistic exploitation of what was encountered to strategies that took into account seasonal and longer-term fluctuations in the availability and abundance of the different resources (Soffer 1989:726). In contrast to Soffer's results for the Russian Plains, Chase (1989) reviewed Middle to Upper Palaeolithic subsistence patterns from the Old World and saw no substantial differences.

The problems associated with the study of materials thought to belong to a period of cultural change seem thus common among archaeologists. Two major points come out of the research done with the Middle to Upper Palaeolithic transition. First, there is an urgent need to clarify what a cultural transition is. A discussion leading to the definition of the term will be presented in Chapter 2. Second, studies on assemblages from transitional sites have to go beyond the descriptive level and inter-sites comparisons are essential. More importantly, the research should focus on how assemblages were produced. In this regard, technological studies, and Binford's (1980) characterization of foragers' and collectors' strategies, seem appropriate in the interpretation of transitional sites.

Finally, the very narrow time span of the Pre-Dorset/Dorset transition in comparison to that of the Middle to Upper Palaeolithic, might be more suitable to study cultural transformations. In effect, although in both cases the basic issues are changes in settlement and subsistence patterns, and in the technology, variables related to massive replacement of human populations might have been of less importance during the Pre-Dorset/Dorset transition.

Is transition a new trend?

Earlier, I stressed the deficiencies associated with the use of the Pre-Dorset/Dorset transition concept. I am afraid that the Pre-Dorset/Dorset transition is taking a life of its own and that archaeologists will (if they haven't already) treat it as a cultural (if not "ethnic") entity. Yet the concept is far from being clearly defined or even tested. My apprehensions are based on the fact that such behaviour (i.e., ready acceptance and use of taxonomic labels) has been common among Arctic archaeologists. To make my point I will now present a model of perception which was originally designed by van der Leeuw (1989) to explain the process of innovation.

In his model, van der Leeuw (1989:311-314) explains that perception is based on the comparison of perceived patterns. At first, comparison takes place outside of any applicable context, so that there is no referent, no specific bias toward similarity or dissimilarity. Once an initial comparison has led to the establishment of a patterning of similarity and dissimilarity, this context is tested against other phenomena to establish the limits of its applicability. There is now a distinct bias to look for similar elements. Here we can think of Diamond Jenness sorting the collection that was shipped to him from Cape Dorset and his later identification of the Cape Dorset Culture in the 1920s (see Jenness 1925). The notion of Pre-Dorset/Dorset continuity stressed by Taylor (1968) can also be associated with this stage of "archaeological perception."

After the context has been well established and is no longer scrutinized, new elements are compared. The comparisons are now biased towards the individuality of new elements and dissimilarity is accentuated. At this stage, we can think of the recognition and definition of the Pre-Dorset culture by Collins (1951) or the Sarqaq culture by Larsen and Melgaard (1958) as different from the homogeneous whole that once characterized the Dorset culture in the minds of Arctic archaeologists.

The model then predicts that once other elements have been judged in this way, the initial bias toward similarity is neutralized and the context is no longer considered relevant. More comparisons will then create another context. This process can be applied to the present-day perception of discontinuity between Early Dorset and Middle Dorset as underlined by Tuck and Ramsden (1990). It can also be linked to the categorization of the Pre-Dorset/Dorset transition as belonging to neither period but rather representing a *mélange* of both Pre-Dorset and Dorset. An original category like "Dorset" is easily recognized because one can discriminate between the elements that belong to it and those that do not. However, a new category like the "Pre-Dorset/Dorset transition" is only defined by elements which belong to it because similarities are still being stressed, but elements which eventually will not are yet to be recognized. The perception of the "Pre-Dorset/Dorset transition" remains "fuzzy and open-ended," to use van der Leeuw's (1989: 315) qualifications of a new category.

By using van der Leeuw's model, one can see that it is not an accident that transitional sites are now a common component of the Arctic literature (e.g., Helmer 1991, Maxwell 1985; Renouf 1993, 1994; Schledermann 1990). This was not the case 30 years ago because Pre-Dorset and Dorset cultures were still being compared as homogeneous entities. As more archaeological research took place in the Arctic, the range of variability between sites increased, broad generalizations became more refined, and new categories emerged. The notion of transition from Pre-Dorset to Dorset was discussed (e.g., Maxwell 1973; Melgaard 1962), but with few exceptions (e.g., Taylor 1968), transitional sites were not recognized as such. Sites were considered to belong to either "Late Pre-Dorset" or "Early Dorset" cultures. The notion of "Pre-Dorset/Dorset transitional sites" started to appear in the Arctic literature only in the 1970s, (e.g., Cox 1978; Maxwell 1976). However, the recognition of such sites is still in a "fuzzy" stage and in need of refinement.

Discussion

The Pre-Dorset/Dorset transitional period is identified by most archaeologists as the beginning of cultural modifications that were accentuated during the Dorset period. As we have seen, other archaeologists (e.g., Tuck and Ramsden 1990) interpret this time period as the end of the Pre-Dorset culture and not as a period of transition. Furthermore, the contrasting views of archaeologists about transitional sites raise the possibility that the specificity of the assemblages they analyze bias their view toward cultural continuity or discontinuity. Archaeologists should remember that the sites they excavate represent only one segment of a greater picture. By focusing on that segment they may lose the perspective of the whole picture and, as in van der Leeuw's model, thus emphasize discontinuity rather than continuity in their data.

Before even talking about a cultural transition, it is necessary to ask if changes in the material culture of the Dorset people were profound enough to constitute a cultural transformation. When microblades and burin-like tool frequencies increase, as they do in Dorset assemblages (e.g., Maxwell 1985:108-109; Schledermann 1990:182-183), do they reflect cultural changes or are they witness to the kind of activities that took place in specific sites? Since the function of burin-like tools is still debated among archaeologists (see Maxwell 1985:142), how can we even begin to understand the reasons for an increase in their use? One may also wonder if by using new types of harpoons, people become different from their predecessors. To take a more recent example, were the first Inuit who hunted with rifles culturally different from their grandparents? Furthermore, were there really major changes in the economy of the Dorset people? After all, both Pre-Dorset and Dorset people exploited sea and land resources.

Even if sea mammal hunting was more emphasized by the Dorset people (e.g., Maxwell 1984, 1985), it does not necessarily mean that their subsistence-settlement system was completely altered. Archaeologists are quick to equate culture with material culture since lithic tools are often the only data they are studying. However, people are more than the technology or the organic midden they left behind. Archaeologists should be more concerned with the meaning of observed changes in material culture and subsistence-settlement patterns than with taxonomy. They still need to verify if there were gradual changes or a sharp cultural break in the technology and economy of people who lived in the Eastern Arctic around 800 to 500 B.C.

It is possible that what researchers have described as discontinuities are actually regional variations and the idea of a cultural transition is still helpful. In effect, the term transition infers, as Taylor (1968) concluded, that there is cultural continuity between the Pre-Dorset and Dorset. In other words, one culture did not replace another but rather cultural changes occurred within the same culture. Thus, Pre-Dorset and Dorset should refer to different chronological segments of one people's history through time. Each period had its own characteristics but overall evidence suggests that these were the same people. Accordingly, regional variations within each period are only that and should not be equated with different cultures (see also Elling 1992).

If the Pre-Dorset/Dorset transition is a viable and workable concept, it should be possible to define and test it. The term transition implies changes and these changes need to be identified. Archaeologists should use a comparative set of attributes that would justify their identification of transitional sites, rather than relying on subjective criteria. They should also identify some of the key elements that were part of the Pre-Dorset to Dorset cultural transformation. Rather than simply identifying the chronological order of cultural material, one has to find what elements *developed* from the Pre-Dorset period and those that *emerged* during the transitional period.

In the case of cultural elements that came out strictly during the Dorset period, there is little need to refer to a cultural transition with the Pre-Dorset. For example, rectangular semi-subterranean houses have been associated with the Dorset period (Maxwell 1985) and if there was Pre-Dorset/Dorset continuity in this cultural aspect, prototypes of such dwelling types can be expected in the context of at least some transitional sites. If these are not found, then this is evidence that such structures emerged only during the Dorset period. Taking such a point of view might reconcile the dichotomy between Early Dorset and Middle Dorset described by Tuck and Ramsden (1990), or that between Groswater and Dorset (Renouf 1994) with the notion of Pre-Dorset to Dorset cultural continuity proposed by Taylor (1968). In other words, some cultural changes associated with the Dorset period were already taking place during the Late Pre-Dorset and transitional periods while others bear no link with the Pre-Dorset culture.

Assuming that the concept of transition proves to be viable, researchers should focus on cultural elements that developed from the Pre-Dorset period and those that emerged during the transitional period in contrast to those that came out of the Dorset period. Such an approach might reconcile the view of Pre-Dorset to Dorset cultural continuity originally stressed by Taylor (1968) with that of discontinuity described recently by other archaeologists. Ultimately, the observation of any lithic, subsistence and/or settlement patterns associated with transitional sites should not be limited to a simple description. The real objective will be to find an explanation for such patterns associated with Palaeoeskimo culture change.

Content of thesis

Chapter 2 begins with a discussion of how to define a cultural transition and what to expect to find in transitional sites. The objectives of the research are then presented along with the methods that will be used to study the Pre-Dorset/Dorset transition. In Chapter 3 each site is described along with an analysis of the intra-site spatial distribution of the lithic and organic artifacts to understand the human activities that created the sites. Chapter 4 presents the faunal evidence from the sites and identifies different subsistence strategies used by the people who occupied the Ivujivik sites. Chapter 5 compares archaeological data from all the sites to infer human patterns of site utilization and verifies if there was indeed a cultural transition that can be traced in specific sites. It is argued that the Pre-Dorset/Dorset transition can be perceived from the archaeological materials. Causal explanations to understand cultural transformations reflected from Palaeoeskimo sites are then discussed. Chapter 6 presents the conclusions of the thesis.

CHAPTER 2

Theory and methods

Towards a definition of transition

Although it is a term widely used by archaeologists to describe cultures undergoing change, it is extremely difficult to find a clear definition of a cultural "transition". The term is taken for granted and even in a publication entitled *Transitions to Agriculture in Prehistory* (Gebauer and Price 1992), none of the contributors found it relevant to discuss the meaning of transitions. In this example, the lack of concern might be because scholars studying Mesolithic societies still disagree on the meaning of the transition from Palaeolithic hunter-gatherers to Neolithic farming. Depending on the researcher, the term "Mesolithic" represents a strictly chronological period, a cultural adaptation or a new economy linked to environmental changes. However, as Zvelebil (1986:6-7) points out, cultural variability of the Mesolithic should not be forced into a shopping list characterized on a presence/absence basis of attributes. This warning could easily be transplanted into other archaeological contexts such as the Pre-Dorset to Dorset transition.

In anthropology, a cultural transition implies that a society went through changes in its social, economic, and ideological components. In archaeology, a cultural transition is perceived from the elements that make up a site (i.e., artifacts, faunal remains, features, etc.). When looked at only by themselves, transitional sites have a mixture of materials that belong to different archaeologically defined cultural entities. The possibility that the sites in question were never occupied during a time of cultural changes, but rather during very distinct chronological periods, will always remain. This will be the case of sites where the stratigraphy, and the understanding of taphonomic processes, does not allow the isolation of single occupations. However, the ambiguity of recognizing transitional sites should stimulate archaeologists to identify areas in need of investigation rather than closing the issue as unsolvable (see Binford 1987:465). One way to identify possible transitional sites is to compare them with those from previous and later cultural periods. Then, it should be possible to look for changes in the composition of the sites in term of technology, subsistence, and settlement patterns.

A transition cannot be defined *a priori* as a regional chronological period since in some sub-regions, changes may have started or ended at different times. Furthermore, the actual rate of change might be highly variable. As we have seen in the case of the Pre-Dorset/Dorset transition, these changes took place within 200 years or at the most, within 1000 years. But when one looks at the Middle/Upper Palaeolithic transition, the changes are thought to have taken place over 15,000 years! Dates thus cannot be the sole indicator of a site occupied during a cultural transition.

The concept of transition implies cultural continuity of some sort. If the cultural components of the Pre-Dorset and Dorset periods were drastically different, we could not speak about a cultural transition between both periods. We would have to agree with Tuck and Ramsden (1990) that the so-called transitional sites are in fact from the end of the Pre-Dorset culture and have nothing to do with the Dorset culture. In transitional assemblages, we should expect to find elements that *developed* from the preceding period and *emerged* within the period of cultural transformations, while being found as integral to the succeeding periods. The links between both periods are essential. Without them, the label of transition is unsubstantiated.

In the case of the Pre-Dorset/Dorset transition, it should not be equated with a specific culture, but looked at as a phase or a stage of cultural changes within the Palaeoeskimo continuum. In fact, even the distinction between the Pre-Dorset and Dorset "cultures," which is often used in the literature in parallel with the Pre-Dorset and Dorset periods, is misleading. We will never know if the cultural differences stressed by archaeologists were relevant to the people who created the sites. It would be simpler and less presumptuous to talk about Pre-Dorset and Dorset periods (i.e., chronological) that are part of a greater Palaeoeskimo culture.

I have difficulties with the labels of Pre-Dorset and Dorset "cultural traditions" recently suggested by Helmer (1994) as I am not convinced that the technological characteristics found in Pre-Dorset and Dorset sites reflect actual differences in the social, economic and ideological systems of the inhabitants of the sites. This said, I could use Helmer's (1994:21) suggestion that the Pre-Dorset/Dorset transition is a cultural horizon by which he means "a useful taxonomic mechanism for recognizing significant temporal changes in material culture, settlement patterns, subsistence strategies and/or social organization within a single Cultural Tradition" (i.e., Palaeoeskimo).

My only reticence comes from the fact that Helmer places the Pre-Dorset/Dorset transition under what he calls the "Dorset Cultural Tradition." However, and as I have stated earlier, elements of a Pre-Dorset/Dorset transition must have developed from the Pre-Dorset period (or "cultural tradition" to use his term). Furthermore, since other elements emerged during the transition to be later fully integrated during the Dorset period, the Pre-Dorset/Dorset transition should belong both at the end of the Pre-Dorset *and* the beginning of the Dorset. The Pre-Dorset/Dorset transition cannot be seen as any cultural horizon within a single cultural tradition (i.e. Dorset), but overlapping both the Pre-Dorset and the Dorset cultural traditions (to use once again Helmer's terms).

Theoretical framework

As we have seen in Chapter 1, Arctic archaeologists have established a chronological and typological order to organize Palaeoeskimo sites. Pre-Dorset and Dorset periods have been described as representing two different adaptive strategies in an Arctic environment, the former adapted to land mammal exploitation and the latter to sea mammal exploitation. Such description has become *the* explanation for culture change between the Pre-Dorset and Dorset periods. Yet, little is understood of the mechanisms that created the assemblage variations found in Palaeoeskimo sites. For example, how can one link the increase of microblades and the appearance of rectangular houses during the Dorset period with an adaptation to sea mammal exploitation? In other words, is it possible to distinguish cultural changes that are primary from those which are contingent or derivative? Obviously, our knowledge of the behaviour of the people who created these sites is still very limited.

This research will question the existence of a Pre-Dorset/Dorset transition by looking at interassemblage variability in Palaeoeskimo sites from Ivujivik in Nunavik (Northern Québec). Rather than investigating the causes of Pre-Dorset/Dorset inter-site variability by building a model based on the current knowledge of Arctic prehistory, I decided to use data where I had a better control on sample strategies and the provenience of artifacts, and then provide a model to explain assemblage composition. In effect, before starting to formulate a model of behavioural variations of Palaeoeskimo people who occupied the Arctic, one needs to identify what cultural elements changed through time. So far, Arctic archaeologists have presented us with lists of cultural traits that appear, disappear, or continue, but little has been properly quantified and/or qualified. Furthermore, while consulting the archaeological literature on Arctic sites, it becomes apparent that the sampling strategies of the excavations are rarely mentioned. This lack of information could easily lead a researcher to identify cultural patterns in archaeological assemblages artificially created by sampling biases.

The theoretical framework of my study is inspired by ecological theory where economic and settlement behaviours are seen as the result of decisions made according to a knowledge of physical and social constraints (see Bennett 1976; Binford 1980; Mithen 1990; Trigger 1991). However, the concluding model explaining Palaeoeskimo intra-site and inter-site variability will not follow the school of ecological determinism. The model will be based on an assessment of what Pre-Dorset and Dorset people knew and how they exploited the Ivujivik region. To this aim, the concept of *land-use* will be a key element as it refers to the cumulative effects of the subsistence, technology and settlement on the ecosystem (Kirch 1980:139). The latter will be the main components of the analyses to be performed on the archaeological material.

A few definitions need to be presented before proceeding into the objectives and methods of the study. *Cultures* are defined here as human "systems of organized behaviour" (Binford 1987:453). *Variation* is a change or deviation in the structural and/or functional composition of an assemblage as compared to the *norm*, the latter being what archaeologists have categorized as representing a Pre-Dorset, transitional, or Dorset assemblage. To measure variation, one looks at the *diversity* as "how quantities of artifacts are distributed among classes" (Jones and Leonard 1989:1). Variation is also understood as differences occurring *within* and *between* the composition of Pre-Dorset, transitional and Dorset assemblages. Studies of variation within sites are also referred to as *intra-site* analyses and can involve comparison of artifact classes, raw materials and faunal remains as well as their spatial distribution between different features (e.g., habitation structures) of a single site (see Carr (1984) for a review of goals and methods). Few intra-site analyses have been performed on archaeological material from the Arctic, but results from such detailed studies have shown that they can increase greatly our understanding of assemblage composition (e.g., McGhee 1980; Park 1989; Stenton 1983). Studies of variation between sites are also referred to as *inter-site* analyses. They compare variability of artifact classes, raw materials and faunal remains as well as patterns in their spatial distribution, between sites. The Pre-Dorset sites analyzed in this study will thus be compared to other Pre-Dorset sites and to transitional and Dorset sites of the same area.

Two adaptive strategies originally defined by Binford (1980) as the *forager* and *collector* strategies, will be essential to understand the nature of the archaeological remains from the Ivujivik sites. In general terms, forager strategies operate to move consumers to resources while collector strategies operate to move resources to consumers (Binford 1987:45). A distinctive characteristic of a foraging strategy is that foragers do not store foods but gather food on an "encounter" basis. They also have a high residential mobility and their residential sites are short-term as well as less visible archaeologically (Binford 1980:6-7). In contrast, collectors store their food for at least part of the year, and have logistically organized food-procurement parties. In other words, they have task groups seeking to secure specific resources in specific context (Binford 1980:10). Collectors have a low residential mobility but they produce more task specific sites. It should be emphasized here that these two strategies are part of a continuum as they are "organizational alternatives which may be employed in varying mixes in different settings (Binford 1980:19)". However, and this is important to the present study, trends toward one end or the other of this spectrum might be recognized. Thus, at a very general level, archaeologically defined cultures may be characterized as having a land-use system of either foragers or collectors, at any point in time.

This said, and contrary to Binford and other archaeologists who have used his model in the Arctic context (e.g., Savelle 1987; Stenton 1989), I do not believe that climatic and environmental variations determine which strategy a society will utilize the most. I think that it is the degree of knowledge of the land that will affect how a group of people exploit its environment. I thus expect that people who are new to an area will tend to behave like foragers, that is exploiting the land in an opportunistic and non-specialized manner, changing base camps frequently and in doing so, leaving relatively fewer archaeological remains. I also expect that once generations of people accumulate traditional knowledge of a specific area, they will begin to change their adaptive strategy. They might continue to act as foragers, although with a different perspective of their environment, or they might transform themselves into collectors, at least seasonally.

If they remain foragers, they will focus their exploitation of resources in specific areas already known to them. From an archaeological point of view, their base camps might look like those from collectors since the accumulation of archaeological features and materials will give the impression that the sites were used intensively for long-term periods. However, the crucial difference from collectors' base camps will be the absence of evidence that food was cached for future use. The latter implies the anticipation of returning to the site later during poor hunting periods of the yearly seasonal round. Binford (1980:16) was aware of such a pattern when he wrote that contrary to his expectations, some cold climate groups such as the Copper Inuit did not always store food and were thus classified primarily as foragers. Since his explanatory model linked highly variable seasonal environments with collector strategies, a group like the Copper Inuit was an odd exception. However, according to Binford (1980:17) these cold-environment foragers were not generalists in their exploitation of resources but rather "serial specialists." By this he meant that they executed "residential mobility so as to position the group with respect to particular food species that are temporally phased in their availability through a seasonal cycle (Binford 1980:17)." I agree with Binford that although the Copper Inuit were highly mobile they were also logistically oriented and I would even tend to define them as "border line forager/collector."

Binford's categorization of forager and collector strategies was based on modern ethnographic examples that did not take into consideration how long a group of people had been in a specific area, and thus how much traditional knowledge they had accumulated. I think that a collector strategy can be developed only when a group of people have accumulated enough traditional knowledge to organize their activities in a logistical manner. Thus, if people transformed themselves into collectors, I would expect them to have been more specialized in their exploitation of resources, to have occupied base camps more intensively, and to have cached food for later use. All these criteria should be verifiable through the remains of archaeological sites.

Finally, I should emphasize here that I do not believe that the shift from forager to collector strategies is a conscious process. The transition from forager to collector, in other words from generalists to specialists (or even to "serial specialists"), was an on-going cultural process linked to the increasing degree of knowledge of the land. It happened at different rates through time and was at first unidirectional. In effect, collectors had to be foragers first. Logically, newcomers in the Arctic (i.e., during the Pre-Dorset period) had to explore the land before settling in a particular area and exploiting its resources in a logistical fashion. Thus, archaeological evidence from different Arctic regions should indicate different rates of change but all should demonstrate some forager to collector shifts if the accumulation of traditional knowledge is the cause of adaptive transformations.

Objectives

Three questions guide the present research. First, what were the cultural differences between the Pre-Dorset and the Dorset periods? Second, how can the differences in the archaeological record be interpreted? And third, is the concept of a Pre-Dorset/Dorset transition a valid one?

The first question will be answered while identifying the range of variability in the record of subsistence, settlement and technological behavior of Palaeoeskimo people who occupied the Ivujivik area. To answer the second question, a model of the land-use system of the Palaeoeskimo populations that occupied the Ivujivik area will be presented to account for the interassemblage variability. The model will explain how people used the sites and when and why they chose to occupy them. It will then be possible to use the model to understand which mechanisms led to interassemblage variability in other Palaeoeskimo sites of the Eastern Arctic. The third question will bring a more subjective answer as it will evaluate the concept of the Pre-Dorset/Dorset transition, within the framework of a forager-collector "transition."

Methods

As indicated in Chapter 1, many ideas developed by Taylor in his 1968 publication on the origins of the Dorset culture had emerged during his examination of archaeological material from Ivujivik (Taylor 1958, 1959a, 1959b). Taylor's (1962a) comparison of stylistic attributes and percentages of artifact classes from three sites led him to believe that they were occupied early in the Pre-Dorset period. However, since his samples were small, the possibility remained that they were not representative of the whole sites and that his chronological estimate was not correct. Initial work in Ivujivik (Avataq 1989, Nagy 1994b) convinced me that Ivujivik was an ideal setting to test Taylor's proposition regarding cultural continuity between the Pre-Dorset and Dorset period. Rather than duplicate another comparative study based strictly on stylistic attributes and percentages of artifacts, the excavation methods and analyses of the archaeological material were to be different from Taylor's approach.

First, I wanted to excavate sites representing Pre-Dorset and Dorset occupations, as well as those that could now be seen as possibly being from the transition. All sites were to be located in the same area to compare how different groups of people exploited a single region during each period. Six sites representing Pre-Dorset, Dorset and possible Pre-Dorset/Dorset transitional occupations were selected after reading reports on archaeological sites from Ivujivik (Aménatech 1984, 1985; Taylor 1962a). Owing to time constraints, five sites rather than six were excavated in Ivujivik during the summers 1988 to 1990 (Nagy 1994a, 1994b, 1995a). Second, better knowledge of the archaeological context was required in order to understand the processes involved in the transition. It was decided to uncover areas as large as possible rather than sample sites by using trenches. This "behavioural" strategy was used to understand how the archaeological material was accumulated and to recreate the activities that were undertaken by the site's inhabitants. Third, the possibility that the assemblages from individual sites might derive from mixed occupations was of serious concern as it may refute my identification of specific chronological periods. Artifacts and faunal remains from individual structures were thus compared to account for diachronic occupations. The study focused on (1) settlement patterns; (2) lithic technology; and (3) subsistence patterns.

Settlement patterns are sets of data concerning the distribution of people and their material remains across the landscape (Earle and Christenson 1980; Jochim 1976, 1981). Lithic technology is composed of the stone tools produced or used at a site and the debitage discarded during tool making processes. It is understood here as one way in which people solved problems posed by external environmental factors (e.g., raw material availability) and by internal social needs (see Torrence 1989:1). The study of lithic technology is thus closely linked to the analysis of subsistence-settlement patterns. Subsistence patterns describe the economic behavior linked to food procurement and consumption of a group of people. Reconstruction of the subsistence-settlement patterns involves the analysis of evidence pertaining to the actual set of behavioral options selected within the domain of choice (McCartney and Helmer 1989:50). Both subsistence and settlement patterns can then be used to model subsistence-settlement systems which are explanatory (Flannery 1973:162). The next section describes the kind of analyses that were performed on the archaeological material collected in the Ivujivik region.

1. Settlement patterns

Habitation structures

Rectangular semi-subterranean dwellings have been described as characteristic of the Dorset period and are supposed to be absent in Pre-Dorset sites (Maxwell 1985:123). As will be described in Chapter 3, four of the five sites excavated in Ivujivik have habitation structures of different shapes. The "exclusiveness" of the rectangular house type as an indicator of Dorset occupation will be examined in light of archaeological evidence from the Ivujivik sites.

The possibility that rectangular structures are associated with occupation during specific seasons will also be addressed. The influence of seasonality on settlement patterns will help verify if archaeologists have been looking at one aspect of the seasonal round (e.g., summer occupation) in one time period (e.g., Pre-Dorset) and contrasting it with another aspect of the season round (e.g., winter occupation) for another time period (e.g., Dorset). The cultural changes usually associated with habitation structures of Pre-Dorset and Dorset sites might be an artifact of sampling biases rather than an accurate reflection of past events.

Activity areas

For each site from Ivujivik, spatial distribution of lithic material and faunal remains were examined to understand the stratigraphy of the sites and to distinguish specific activity areas. These analyses were essential to understand the internal dynamics of each site rather than be limited to considerations on the whole site content (i.e., long descriptive lists of tool types).

First, these analyses helped clarify the stratigraphy of the sites. In effect, in three of the sites, two stratigraphic levels were excavated and it was not clear if they represented cultural or natural levels. Since two of these sites were dated to the transition period, it was extremely important to decide if the two levels were cultural. If this was the case, the lithic and faunal assemblages could thus contain materials from distinct Pre-Dorset and Dorset occupations but not from the transition. To understand the chronological sequence of each level, the spatial distribution of artifacts was compared between both levels. Furthermore, the frequencies of raw material and artifact classes were also compared between both levels. Many attempts at refitting artifacts between the different levels proved extremely useful in deciding if the two levels were strictly geological.

Second, tools were identified by functional categories and maps showing the spatial distribution of the major tool classes were drawn for each site (Nagy 1995b). This was done to identify the different activities that took place in specific areas of the sites. The many maps produced are not integrated in the present study but their results are. Tables listing the percentages of major tool classes were also generated for each structure or activity area. Then, the patterns of tool distribution were compared between structures and/or activity areas, within each site and between sites. These comparisons indicated whether the structures were occupied in a similar manner and if the sites showed major changes in the overall pattern of their utilization by Palaeoeskimo people.

2. *Lithic technology*

The analysis of the lithic assemblages began by looking at stylistic similarities with tools from other sites that had been dated to provide the Ivujivik sites with a relative date of occupation. This was done because only three of the five sites considered for the present study contained material that could be dated through radiocarbon. It does not follow that I accept the typological dating of Eastern Arctic Palaeoeskimo sites without problems. However, relative dating was the best method to use given the circumstances. Then, the analysis focused on two items: raw materials and production techniques.

Raw materials

Raw material percentages were compared between sites to ascertain any differential use of lithic sources during the Pre-Dorset, transitional and Dorset periods. In effect, it has been proposed by Maxwell (1960:35-36, 1973:300) that Pre-Dorset people relied almost exclusively on chert to make their tools while Dorset people used a greater variety of raw materials (Maxwell 1973:294). Pre-Dorset sites from Baffin Island (Maxwell 1973), the west coast of Québec (Plumet 1980; Taylor 1962a, 1968) and Labrador (Cox 1978) all contained almost exclusively artifacts made of chert. The same situation was found in Independence I sites from Greenland (Møbjerg 1988), which date to the Pre-Dorset period. The exception to this trend is found in Pre-Dorset sites from Ungava (Plumet 1994) where local materials, such as Diana Bay quartzite, predominate.

According to Maxwell (1973) an increase in the choice of lithic sources can be detected in transitional sites between the Pre-Dorset and the Dorset periods. However, recent excavations at a transitional site in Newfoundland showed that local chert still dominated the assemblage and that the range of other lithic sources is rather limited (Renouf 1994). Also, Saqqaq sites from western Greenland that date to the transitional period, are mainly composed of silicified slate (Grønnow 1994; Møbjerg 1986). The presence of this raw material, at undated sites containing mostly flakes, has been interpreted as an indicator of Saqqaq affiliation (e.g., Møbjerg 1986:48). When chert was not available, local sources of other raw material might thus have been favored during the transition.

During the Dorset period, people from western Greenland apparently had a preference for milky quartz (also called "chalcedony" in the literature), but other materials were also used (Møbjerg 1986:48-49). Local raw materials such as quartz and quartzite still dominate the composition of Dorset assemblages from Ungava sites and thus show continuity with the Pre-Dorset period (Plumet 1985:252; Gauvin 1990; Plumet and Gangloff 1991:148). In Labrador, local materials other than chert were more exploited during the Dorset period (Nagle 1984), thus departing from the Pre-Dorset tendency in this region of using mostly chert. In the case of Baffin Island, a recent comparative analysis of two Dorset assemblages has demonstrated that crystal quartz was the most common raw material (Litwinionek 1990), thus confirming Maxwell's ideas about the increasing utilization of diverse lithic sources by the Dorset people.

Possible sources of exotic lithic materials were also considered in the present study in order to reconstruct travelling routes and trading networks between the people who occupied the Ivujivik region and other people of the Eastern Arctic. Raw material sources are also important in tracing trading routes and possible migration of Palaeoeskimo people from Northern Québec. According to Plumet (1978, 1986, 1994), since no lithic material originating west of Wakeham Bay or north of Ungava Bay was found in Pre-Dorset sites, but much material from Labrador was recovered, then the migration of people must have come from the east. This idea was tested with material from Ivujivik since it contrasts with Taylor's (1964) proposition that the Pre-Dorset peopling of northern Québec originated from Baffin Island with a crossing of Hudson Strait. It may very well be that this route was taken only by the people who occupied the east coast of Hudson Bay (see Plumet 1994).

Finally, the spatial distribution of raw materials within each site was also considered to verify that similar materials were used by each household. If this was the case, then the possibility of contemporaneous occupations would be supported, or at least considered. The use of raw materials was also compared between sites to see if any patterns emerged during each chronological period.

Production techniques

All the assemblages were divided into two major classes of artifacts: debitage and lithic objects that were worked and/or utilized. Spatial distribution of each class was plotted in order to locate areas where tool production was undertaken and to identify the different activities that took place at individual sites. The percentages of debitage and worked and/or utilized lithic objects were then compared between sites to verify if any patterns would emerge. Particular attention was paid to two categories of artifacts, namely the burins (and "burin-like tools") and the microblades. The reason for this focus is that, excluding flakes, these two types of artifacts often constitute the majority of the lithic assemblages from Pre-Dorset and Dorset sites.

Microblade technology

No doubt because of their ubiquitous presence in Palaeoeskimo sites, microblades have puzzled many Arctic archaeologists for decades. Taylor (1962b) distinguished blades from microblades by considering their respective widths. Blades smaller in width than 11 mm were to be called microblades. Other researchers performed quantitative and qualitative analysis on microblade assemblages (e.g., Maxwell 1976; McGhee 1970; Owen 1986, 1988). In the case of the most recent work by Owen, her conclusions were that qualitative rather then quantitative attributes should be considered when comparing microblade assemblages. In a study of temporal trends, Maxwell (1976:74) showed a steady increase in microblade percentages from Baffin Island during Late Pre-Dorset, reaching a peak during the transitional period and diminishing in Dorset sites. An increase in microblade numbers during the transitional period was similarly noted by Owen (1988:54). Percentages of microblades from the five Ivujivik sites were compared to verify whether or not they followed the chronological patterns found by Maxwell. All the microblades of the Ivujivik sites were measured to determine the possibility of variations in their width, length and thickness between the Pre-Dorset and the Dorset periods (Nagy 1995c).

Arctic archaeologists usually include microblades in the category of finished tools, even though they are more than often unretouched. Since microblades seem to become more abundant in Dorset sites, they tend to dominate the assemblage, and thus most other tool categories seem under-represented. An abundance of microblades might bias a reconstruction of activities occurring at a site toward one main activity: the use and/or production of microblades. Although some microblades were hafted and notched (e.g., Fitzhugh 1976:107; Owen 1984, 1988), the great majority seem to have been expedient tools; that is, tools easily made, used and quickly discarded. As noted by Maxwell (1976:74):"a person pressing microblades from a core would probably make a number of these artifacts at one time ... therefore changes in the relative frequencies may reflect intensive activity in making microblades." Thus, if unmodified microblades are combined with the debitage, comparisons between Pre-Dorset and Dorset assemblages could appear drastically different. Microblades from the Ivujivik assemblages were divided into two categories: unmodified and modified. The unmodified microblades were grouped with debitage and the ones that were modified, either by usewear or by intentional retouch, were grouped with worked or utilized lithic objects.

While studying butchering activities of Dorset people, Murray (1966, cited in Maxwell 1985:142), found very few shallow cut marks on bones and concluded that carcasses were disarticulated with sharp knives such as microblades. Renouf (1994:189) arrived at similar conclusions based on the experimental flensing and dismembering of a young porpoise with microblades. She regarded microblades rather than bifacial knives as the prime butchering tool. If microblades from the Ivujivik sites were used primarily in the context of butchering activities, there should be a correlation in the spatial distribution of modified microblades and faunal material.

Although Maxwell (1985:142) also successfully skinned and butchered a small ringed seal with microblades, he suggested that the dominant use of microblades was in sewing (Maxwell 1976:74). Furthermore, he proposed that since sewing activities probably occurred at specific seasons, then the relative frequencies of microblades were more likely to reflect seasonal differences in site occupation rather than long-term chronological differences between sites. This possibility was considered in the analysis of the Ivujivik microblades and was evaluated in light of archaeological evidence for seasonal occupation. The spatial distribution of modified microblades was also compared to those of tools used during sewing activities (i.e., awls, needles and endscrapers).

Burin technology

Despite many efforts in classifying burins from Palaeoeskimo assemblages (e.g., Gordon 1990; Maxwell 1973; Plumet 1980; Robertson 1988; Taylor 1968), the major distinction used in burin typology is still the degree of polishing. To be consistent with most researchers, burins from Ivujivik were divided into two major classes: burins and burin-like tools. The burins found in Ivujivik were of three types: expedient burins, spalled burins and polished burins. The expedient burins were quickly made by breaking flakes that were usually unretouched and using the broken edge as a burin (see Plate 3-g). This is indicated by traces of polishing from usewear found along the rectangular profile edge of these burins. This category includes the burins made on blades, microblades or flakes (see also Plumet 1980; Taylor 1968). The spalled burins were made on retouched flakes that were spalled as witnessed by the remaining scars of burin spalls. The polished burins were polished mostly in the dorsal face of the distal end, but sometimes on both dorsal and ventral faces, as well as along the distal edge. In the Ivujivik assemblages, all the polished burins were spalled, a characteristic that might prove to be important in defining the Pre-Dorset/Dorset transition. In effect, Schledermann (1990:337) noted that

> during the transition to Early Dorset, spalls continued to be struck as a means of rejuvenating the incising tip, even though distal grinding of the dorsal and ventral surfaces is the predominant mode of manufacture.

Only the burin-like tools were manufactured completely by polishing. The working edges of polished burins and burin-like tools were likely sharpened with abraders (see Plate 12-a, d). However, in the case of burin-like tools, spalls were not taken off. The frequencies and percentages of the different burins found in Ivujivik were compared within sites and between them.

Burin spalls were classified under debitage as none showed signs of modification for use as tools as has been observed for specimens from ASTt sites in Alaska (Giddings 1967:264), Pre-Dorset (Independence I and Saqqaq) sites in Greenland (Larsen and Melgaard 1958:52-52; Møbjerg 1988:949, 951), the High Arctic (Schledermann 1990:337) and the Eastern Arctic (Collins 1956:71, Taylor 1968:23). Taylor (1968:84-85) described burin spalls from Ivujivik with usewear but it is not clear from his writing if the usewear originated when the spall was part of the burin or after is was spalled (i.e., as a product of use). Few burin spalls from Ivujivik had traces of usewear, but since the latter was never found in the ventral face of the spall, it was assumed that usewear was produced before the spall was struck.

Burins have been used by Arctic archaeologists as chronological indicators. Taylor (1962a:90) interpreted the low presence of ground burins at the Meeus, Mangiuk and Pita sites as a chronological indicator and concluded that the sites were occupied during the early Pre-Dorset period. Taylor (1968:82) later concluded that polishing techniques started at the beginning of the Dorset period but were "seeded" in Pre-Dorset contexts. Maxwell (1973:337) also noted the decrease of spalled burins and the parallel increase of the burin-like tools during the Dorset period. Schledermann (1990:336) indicated that in the High Arctic, the use of burins was most pronounced during the Late Pre-Dorset period. His description of an assemblage from a Pre-Dorset/Dorset transitional site comprises many burin types

> from completely flaked ... to predominantly ground specimens with completely ground distal ends. The burin spalls reflect the same variation in manufacturing technique, with both elements representing a good example of transitional state of burin manufacture, with edge and tip rejuvenation being accomplished increasingly through grinding. [Schledermann 1990:182-83]

If such a pattern can be generalized to other transitional sites, then an increase in grinding technology should be visible in burins and burin spalls associated with such sites.

In his analysis of material from High Arctic, Schledermann (1990) did not distinguish between burins and burin-like tools. Technologically speaking, he is probably correct in not distinguishing the two categories, since the major difference is in the grinding involved in their manufacture. However, it is difficult to say if the function of burins changed from an implement used to work organic material to something totally different. While studying burins from ASTt sites, Giddings (1964:211) made the point that although the burin category encompasses tools made by a similar technique, they may have not been used for in a similar manner or on identical materials.

Taylor (1968:70) differentiated burin-like tools from burins since the spalling technique was not used in their manufacture. He nevertheless thought that they were used as burins to "cut, incise, perforate, split, slot, slit, and slice bone, antler and ivory." According to Schledermann (1990:336) the use of burins with a variable amount of grinding is linked to the manufacture of partially closed-socketed harpoon heads. In contrast, Maxwell (1985:142) likens burin-like tools made of chalcedony (also called Nanook burin-like tools) to knives that were used to separate blubber from meat. His argument is that under magnification there are no signs of wear or heavy use, but meat fibers could be seen in the polished striae. This association might be fortuitous as these tools were "initially buried in garbage consisting mainly of meat" (Maxwell 1985:144). However, since other tools could be used for the same activity, it is odd that specialized tools such as burin-like tools were used in that manner. The suggestion that burin-like tools were used as burins to work organic materials seems more appropriate.

Maxwell (1976, 1985) has argued that burins, burin-like tools and small sidescrapers and endscrapers form a single toolkit for shaping ivory and antler hunting weapons, and that this manufacturing activity occurred mostly during warmer months. If he is correct, a higher frequency of burins should be expected at sites occupied during the summer. Furthermore, these lithic tools should be associated with waste remnants from activities linked with the work of ivory and antler. Burins and organic materials from the Ivujivik sites were plotted to explore the possibility of their association. Maxwell's idea could also imply that a high incidence of burins versus burin-like tools is not a characteristic of Pre-Dorset sites but rather a function of the activities undertaken at a particular site. This possibility was explored by comparing the chronological order of the Ivujivik sites and their percentage of burins. Finally, faunal evidence related to the season of occupation of the sites helped decide if these manufacturing activities took place during the warmer months.

3. *Subsistence patterns*

In the Arctic archaeological literature, there is a general assumption that Pre-Dorset people relied more on caribou and Dorset people more on seal (e.g., Maxwell 1976; McGhee 1978). However, because few Pre-Dorset sites exhibit good preservation of faunal material, this assumption remains to be substantiated. This duality between the terrestrial and marine components of the Palaeoeskimo economies has been recently challenged by McCartney and Helmer (1989) using a model involving a contrast between food (sea mammals) and raw material (land mammals) sources. If the original assumption is correct, Pre-Dorset sites should contain mostly terrestrial mammals while Dorset sites should contain mainly sea mammals. Changes related to the relative importance of birds, waterfowl, fish and smaller land mammals might also be noticeable. In the case of the sites included in the present study, because they are all located near the coast, it is very likely that the species that were exploited were marine mammals. Despite this fact, it is possible that the faunal assemblages will show variation in terms of the species being exploited since these sites might have been occupied at different seasons of the year during which diverse species were available in the Ivujivik area (see Roy 1971a, 1971b).

The Ivujivik sites, with their faunal remains and their different dates of occupation, should help to test if there is a contrast between sea mammal and land mammal exploitation, as well as the possibility that the sites exhibit variation in the range of marine resources that were hunted. Three (KcFr-3, KcFr-8A and KcFr-5) of the five Ivujivik sites have excellent organic preservation with substantial faunal assemblages. KcFr-8A has lithic artifacts resembling those found in Dorset sites while Pita (KcFr-5) and Ohituk (KcFr-3A) have been dated to the time of the Pre-Dorset/Dorset transition. This provides an ideal opportunity for comparison of subsistence patterns and seasonality of occupation between Pre-Dorset/Dorset transitional sites and Dorset sites in a rather localized area on the Ivujivik peninsula.

The faunal analysis focused on (1) species selection, (2) season of occupation and on (3) element distributions. Opportunistic or generalized hunting should be reflected by high diversity in the species represented at the site while planned hunting on specific species should show low diversity (see Renouf 1993; Soffer 1989). Seasonality of site occupation was assessed through the identification of species found at the sites and limited reading of seal tooth cross-sections. In the case of Ivujivik, sensitive seasonal indicators include the presence of whales, walrus, caribou of a certain sex and age, as well as waterfowl. Such analyses will help test if the contrast land mammal/sea mammal is a reflection of different seasons of site occupation. Particular attention was given to element representation to verify whether or not there was continuity in the way people used the different parts of the animals they exploited during the Pre-Dorset and Dorset periods.

Spatial distribution of selected faunal material was plotted to assess the possibility of contemporaneity of different habitation structures within a same site. Furthermore, food sharing patterns might be different from site to site and thus indicate a change in the social behaviour concerning economic resources. Ethnographic accounts of meat sharing among the Inuit insist on the importance of this practice particularly in regard to seals (e.g., Balikci 1970; Damas 1972; Fienup-Riordan 1983; Guédon 1967; Holtved 1967; Van de Velde 1956). Although there are variations regarding which gender cut the seals and which parts of the animal went to whom, it is reasonable to expect some form of meat sharing among

Palaeoeskimo populations. Meat sharing among households should be reflected by bones from an individual carcass found in different habitation structures. Successful attempts at refitting carcasses have demonstrated that specific animals were shared by the inhabitants of different households during the Upper Palaeolithic (Enloe 1991, 1992).

In the case of Palaeoeskimo sites, the situation might be more complicated since different households should have received different parts of the seals and thus the end result would be that all the elements of a skeleton would be represented in a site if numerous animals were hunted. However, by focusing on immature seals, which are easily recognizable, one should distinguish some patterns, if indeed seal meat was shared. Another problem is that most of the bones might have been discarded in a dump area, away from the habitation structures. Although many bones were thrown away in what became midden areas, faunal material was also found associated with habitation structures in three of the sites from Ivujivik. There is also the possibility that immediately prior to abandonment of a site, people were less careful about discarding animal bones away from their habitations. Although this scenario sounds like the "Pompeii premise" (see Binford 1981) and does not take into account the taphonomic processes, this idea will be considered.

Summary

This study evaluates the existence of a transition between the Pre-Dorset and Dorset periods by examining assemblage variability from five sites located near Ivujivik (Northern Québec). First, the settlement patterns will be investigated with a focus on the expected presence of rectangular semi-subterranean structures during the Dorset period and possibly earlier. Furthermore, patterns of tool distribution will be used to identify and compare the range of activities that took place at the sites. Second, selected lithic criteria that distinguish Pre-Dorset from Dorset sites will be tested against the archaeological material from the Ivujivik area. Third, evidence of subsistence, and especially changes in subsistence, will be examined.

Through these analyses, a land-use model will be developed for the Palaeoeskimo populations that occupied the Ivujivik area. This model will explain assemblage variability in terms of how people used the Ivujivik sites and why they chose to live there. It will then be possible to use this model to understand which mechanisms led to interassemblage variability in other Palaeoeskimo sites. Ultimately, it will assess the relevance of using the concept of a Pre-Dorset/Dorset transition in Arctic archaeology.

CHAPTER 3

Palaeoeskimo sites of the Ivujivik area

Ivujivik geology and climate

The Inuit village of Ivujivik is located on the extreme northwest tip of Québec (Figures 3.1, 3.2). The region is part of the Sugluk Plateau of the Canadian Shield (Bostock 1972; Stockwell et al. 1972). In the area of study, the plateau is low and the rounded bedrock hills that form the Ivujivik Peninsula are generally less than 100 metres above sea level. Major deposits include conglomerate, sandstone, quartz, quartzite, limestone, dolomite and chert. Most of the plateau consists of exposed bedrock that is sometimes covered by a thin mantle of glacial till (Bostock 1972). This eastern portion of the Hudson Bay coast went through one of the world's largest glacioisostatic adjustments during the Holocene with 300 metres of land emergence in 8000 years, a rate of about 1 metre per 100 years for the last 2800 years (Allard and Tremblay 1983; Hillaire-Marcel 1976).

Although Ivujivik is located below the Arctic circle, its climate is in the Polar Tundra Climatic Zone with an annual mean temperature of -5.0°C and a yearly average of twenty frost-free days. Annual precipitation is in excess of 40 cm, half of which is snow (Aménatech 1985:4). The vegetation of the region consists mainly of moss-lichen tundra mixed with herbaceous and shrubby elements such as dwarf birch, willow and alder. Exposed and dry areas are composed of moss and lichens while less well drained areas contain Cyperaceae, Gramineae and some sphagnum colonies (Bournérias 1971; Richard 1981; Rousseau 1968).

Human occupations

Ivujivik occupies a strategic place in the peopling of Arctic Québec. In effect, Ivujivik is located at the northwest extremity of Québec and it is likely that the first human populations that started to occupy the Hudson Bay and the Hudson Strait, or even the Labrador coast, passed through the Ivujivik Peninsula. The oral history of Inuit from Ivujivik and Salluit mentions that people first came from the Hudson Strait using the large umiak. "They came first to Ivujivik because that's the shortest route" (told by Taiara in Graburn 1972:54). The latter quote could of course reflect the boat building sophistication of the people who lived during the more recent Thule period (Hickey, pers. comm. 1996). As will be seen in the next chapter, the region is rich in animals and the presence of a polynia in Ivujivik allows the exploitation of marine mammals all year long (Roy 1971a:122).

Archaeological surveys and excavations in the Ivujivik region have shown that people were there during the Pre-Dorset (ca. 3000 to 800 B.C.), the Dorset (ca. 800 B.C. to A.D. 1000) and the Thule (A.D. 1000 to ca. 1800) periods (Aménatech Inc. 1985; Avataq 1989;

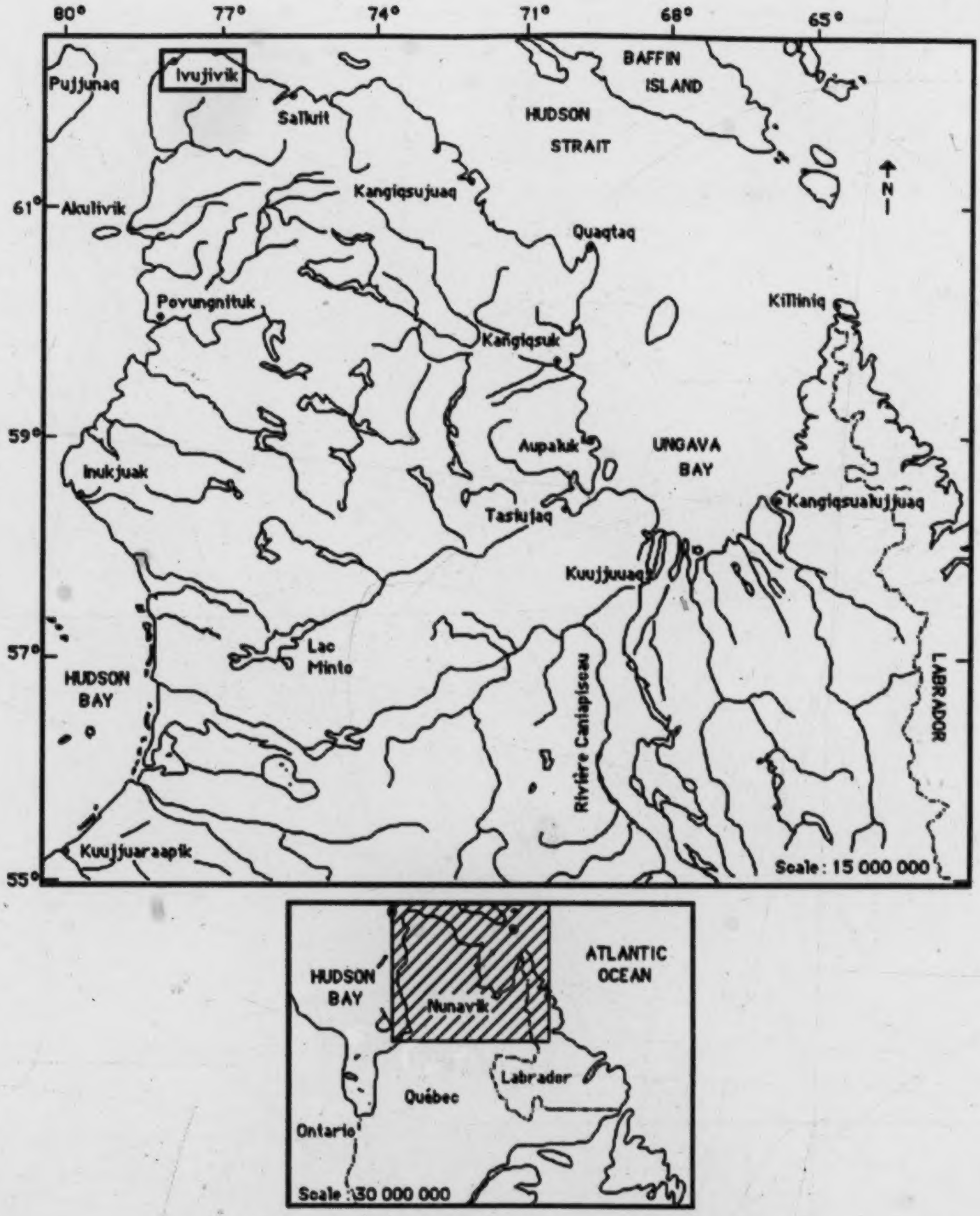

80°
77°
74°
71°
68°
65°
Pujjunaq
Ivujivik
Salluit
BAFFIN ISLAND
HUDSON STRAIT
N
61°
Akulivik
Kangiqsujuaq
Quaqtaq
Povungnituk
Kangiqsuk
Killiniq
59°
Aupaluk
UNGAVA BAY
Inukjuak
Tasiujaq
Kangiqsualujjuaq
Kuujjuuaq
57°
Lac Minto
HUDSON BAY
Rivière Caniapiscau
LABRADOR
55°
Kuujjuaraapik
Scale : 15 000 000
HUDSON BAY
ATLANTIC OCEAN
Nunavik
Labrador
Québec
Ontario
Scale : 30 000 000

Figure 3.1 Location of Ivujivik (Nunavik, Northern Québec)

Leechman 1943; Taylor 1962a, 1968). Data from archaeological surveys of the Ivujivik region suggest that human presence was more numerous during the Palaeoeskimo periods (i.e., Pre-Dorset and Dorset) than during the Neoeskimo period (i.e., Thule and Historic Inuit). Twelve archaeological sites have been reported in the region and of these, three were identified as Pre-Dorset, two as transitional between Pre-Dorset and Dorset, three as Dorset, two containing the whole spectrum of Palaeoeskimo and Neoeskimo occupations, and two were labeled as "undetermined Palaeoeskimo" occupations (Aménatech 1985; Nagy 1994a, 1994b, 1995a).

Numerous archaeological sites located southeast of Ivujivik on small islands north and west of Ivujivik, and on Saaraqjaaq (one of Digges Islands), were shown to the author by Inuit assistants during the 1989 field season. More sites located on the Nuvuk islands were also located on maps by Inuit assistants. A Dorset site had been excavated on those islands in the 1930s (Leechman 1943). Ivujivik is also rich in lithic sources as witnessed by a quartz quarry located 2 km southeast of the modern village of Ivujivik (see also Taylor 1960:2). Steatite quarries were also reported 65 miles southeast of Ivujivik and on Saaraqjaaq (Roy 1971a:267). In terms of traditional use by the Inuit, the Ivujivik region has the second highest density of place names along the Nunavik coastline, which reflects the intensive use and knowledge of the area by the Ivujivimiut (Müller-Wille 1990:41).

Ivujivik is also very important in understanding the study of human history of the Eastern Arctic, since this is the area where William E. Taylor Jr. first worked before excavating the Arnapik site on Pujjunaq (Mansel Island) and the Tyara site (near Salluit). The latter excavations and the subsequent analyses of the artifacts led Taylor to conclude that there was cultural continuity from Pre-Dorset to Dorset culture in the Canadian Eastern Arctic and that within this area, the Dorset culture developed *in situ* (Taylor 1968). While in Ivujivik during the summers of 1958 and 1959, Taylor and his assistants identified and tested five archaeological sites: Eeteevianee (KcFr-1), Ohituk (KcFr-3), Meeus (KcFr-4), Pita (KcFr-5) and Mangiuk (KcFr-7) (see Figure 3.2). Taylor associated the Eeteevianee site with the Dorset period and the Ohituk site with an early Dorset occupation (Taylor 1960, 1962a). The artifacts from the Meeus, Pita and Mangiuk sites were assigned to Pre-Dorset occupations. Taylor (1962a:90) also assigned the term "Ivujivik complex" to the lithic material of these three sites which he saw as part of early Pre-Dorset material.

For the reasons outlined in Chapter 2, two of the sites originally tested by Taylor and two sites recently identified by Aménatech (1985) were selected for excavation during the summers of 1989 and 1990. A fifth site, also originally identified and tested by Taylor, was excavated in 1988 in the context of salvage operations (Avataq 1989; Nagy 1994b) and was integrated with the present study.

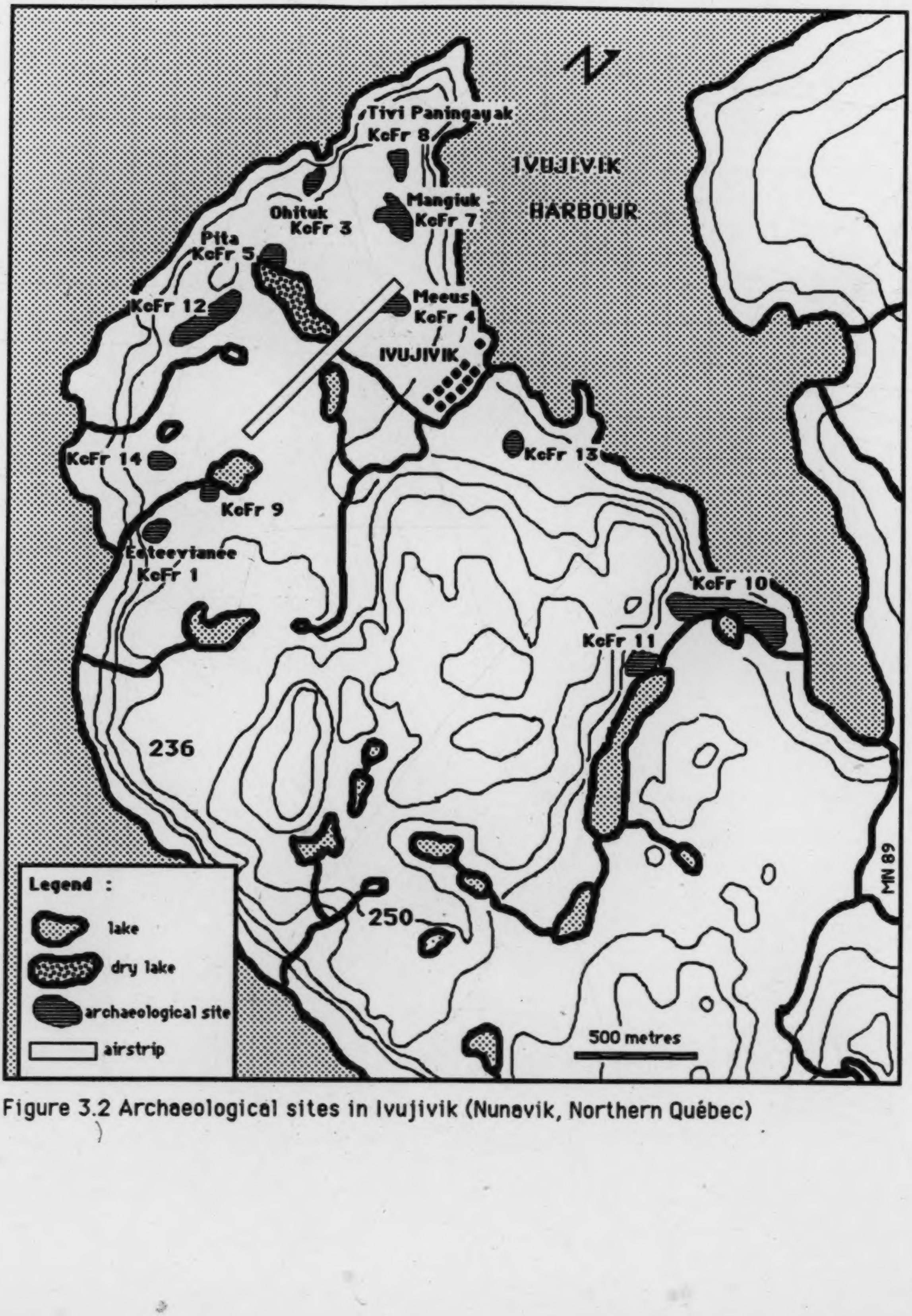

N
Tivi Paningayak
KcFr 8
IVUJIVIK
HARBOUR
Mangiuk
KcFr 7
Ohituk
KcFr 3
Pita
KcFr 5
KcFr 12
Meeus
KcFr 4
IVUJIVIK
KcFr 14
KcFr 13
KcFr 9
Eeteevianee
KcFr 1
KcFr 10
KcFr 11
236
250
Legend :
lake
dry lake
archaeological site
airstrip
500 metres
MN 89

Figure 3.2 Archaeological sites in Ivujivik (Nunavik, Northern Québec)

The following section describes the archaeological sites included in this research. The sites are presented in the chronological order of their occupations. Interpretation of human activities that created the sites will be derived from the recovered material culture. These reconstructions are important since they are used to compare activities that took place in different structures within each site and thus assess whether the sites were occupied in a similar manner through time. In Chapter 5, the major human activities identified at each site will be compared *between* sites to determine if cultural transformations can be seen at the so-called Pre-Dorset/Dorset transitional sites in comparison to those found in the other Palaeoeskimo sites.

Pre-Dorset sites: Mangiuk (KcFr-7) and Tivi Paningayak, area B (KcFr-8B)

Mangiuk (KcFr-7)

Description

The Mangiuk site (KcFr-7) was originally recorded and tested by Taylor in 1959 (Taylor 1962a). It is located on a gravel deposit at about 150 metres from the present shoreline and is bordered in the north and the south by rocky exposures. Its coordinates are 62°25'32"N and 77°55'04"W. The site covers about 180 metres (north-south) by 160 metres (east-west). It was divided in four areas by Aménatech (1985) but in 1989, only the northeast (which I called KcFr-7NE) and north (which I called KcFr-7N) areas were excavated (Figure 3.3). KcFr-7NE has an elevation of 51 metres above sea level, while KcFr-7N has an elevation of 46 metres.

KcFr-7NE is bordered in the northeast by a 1.2 metres high rocky exposure and in the southwest by a rocky slope (Figure 3.4). Its maximum dimensions are 42 metres (east-west) by 15 metres (north-south). Nine habitation structures were identified by Aménatech (1985:43) in 1984. All areas where the structures had been mapped were tested in 1989 but only three contained lithic material. These are structures AJ, AI and AB. Sixty square metres were excavated at KcFr-7NE in 1989. The stratigraphy of KcFr-7NE is composed of a sod layer, about 3 cm thick. It is juxtaposed to a dark brown organic layer mixed with small rocks, about 3 to 10 cm thick. This is the only cultural level.

Structure AJ was first thought to have had a mid-passage. After excavation, the passage was less evident. The dimensions of structure AJ are 2.5 x 3.2 metres. If the mid-passage is indeed there, the general form of the structure would be associated with a Pre-Dorset occupation. Structure AI is a tent ring 3 metres in diameter with charcoal remains near its entrance indicating the used of a hearth somewhere near the edge or outside of the tent. It is possible that structure AB was once a tent, but no tent ring (i.e., rocks in a circular arrangement) was found. The presence of lithic material and a change in the vegetation in this location suggests the possibility that this was an open area where human activities took place. Another interpretation is that structure AB was a snow house (Tivi Paningayak, pers. comm. 1989), which would indicate at least one winter occupation in this area of the site.

KcFr-7N is delimited in the north by a rock wall of 1.5 metres in height (Figure 3.5) that protects it from the west wind. On the north-south axis, this area occupies between 4 and 12 metres and it covers 45 metres on the east-west axis. Sixteen habitation structures were identified by Aménatech (1985:33) in 1984. Although all their locations were tested, only six yielded lithic artifacts. These are structures D, E, G, H, I and J. Forty-five square metres were excavated in 1989.

Structure D was probably a tent ring of 4 metres in diameter. Structure E seems to have been a tent ring from which rocks were later displaced. There is also a possibility that this was a snow house. This structure measured between 3 and 4 metres in diameter. Structure G was a tent ring 3 metres in diameter and its northern part was tested in 1984 by Aménatech. Structures H and I were of circular form, possibly tents, measuring 3 metres in diameter. The presumed structure J contained very few lithic flakes but no tent ring was identified, and it was not linked to a habitation structure. But here again, it may have been a snow house. A small circular depression 1 metre in diameter, possibly a cache, is located southwest of structure G (Aménatech 1985) but was not excavated due to time constraints. To summarize, six structures were positively identified as tent rings at the Mangiuk site. Two areas contained evidence of human activities but they were not associated with structural remains.

Chronology

Similarities in the style of lithic artifacts and in the raw materials suggest that both areas of the Mangiuk site were occupied at the same time, or at least by the same cultural group. The style of the lithic artifacts is related to the Pre-Dorset period (Plates 1-3). During the time of its occupation, which was estimated at about 2000-1500 B.C. by Taylor (1962a:90), the Mangiuk site was located at about 10 metres above sea level (Andrews et al. 1971: 217).

Nature of occupations

The artifacts from the north and northeast areas of the Mangiuk site were grouped together as it appears that both areas were occupied within the same time period or by people belonging to the same culture. This interpretation was suggested by three lines of evidence. First, distribution of classes of debitage and tools, and of raw materials were similar in both areas (Tables 3.1 and 3.2). Second, two burins made in a distinctive grey

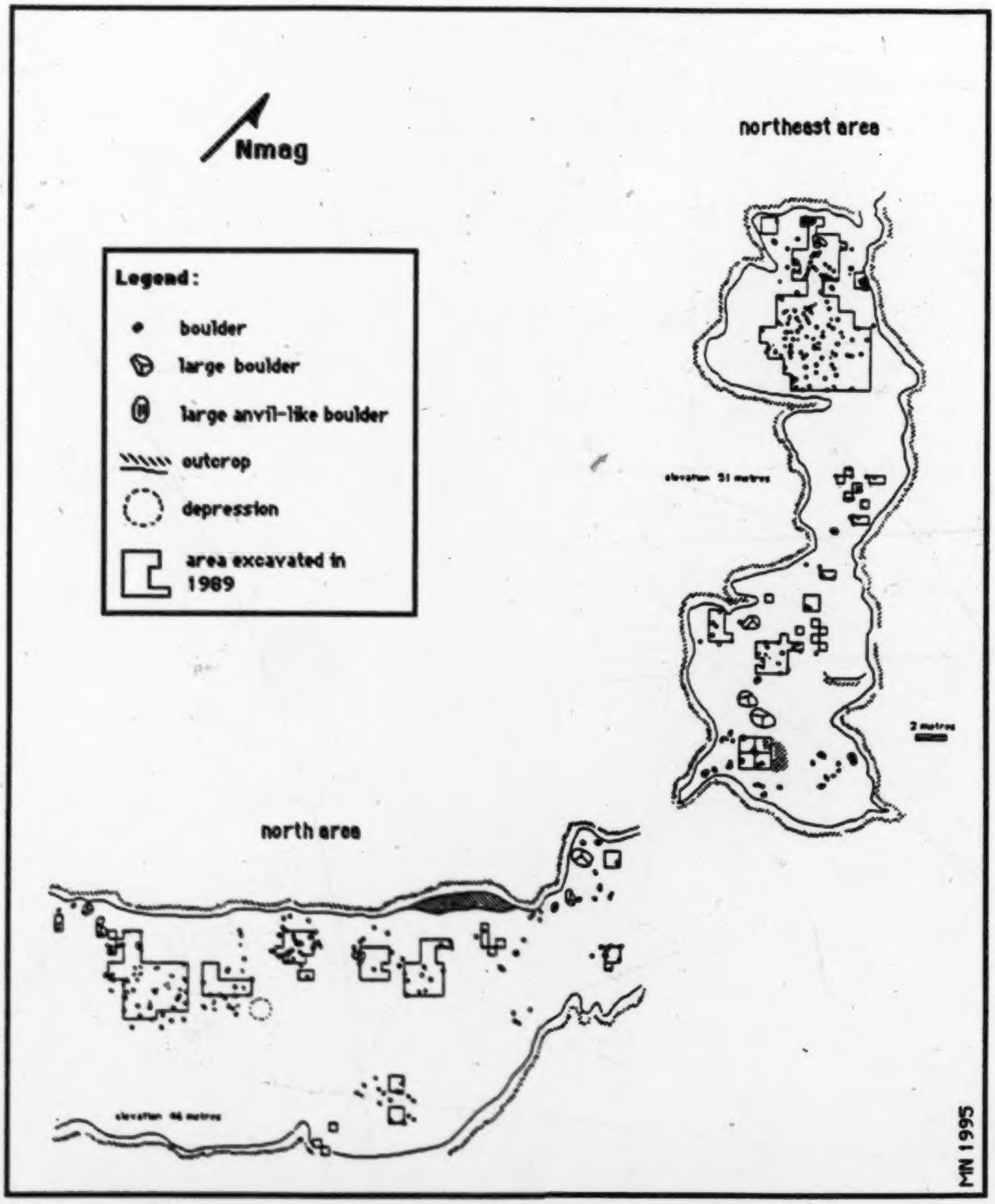

Nmag
Legend:
boulder
large boulder
large anvil-like boulder
outcrop
depression
area excavated in 1989
northeast area
elevation 31 metres
2 metres
north area
elevation 46 metres
MN 1995

Figure 3.3 Mangiuk site (KcFr-7): North and northeast areas

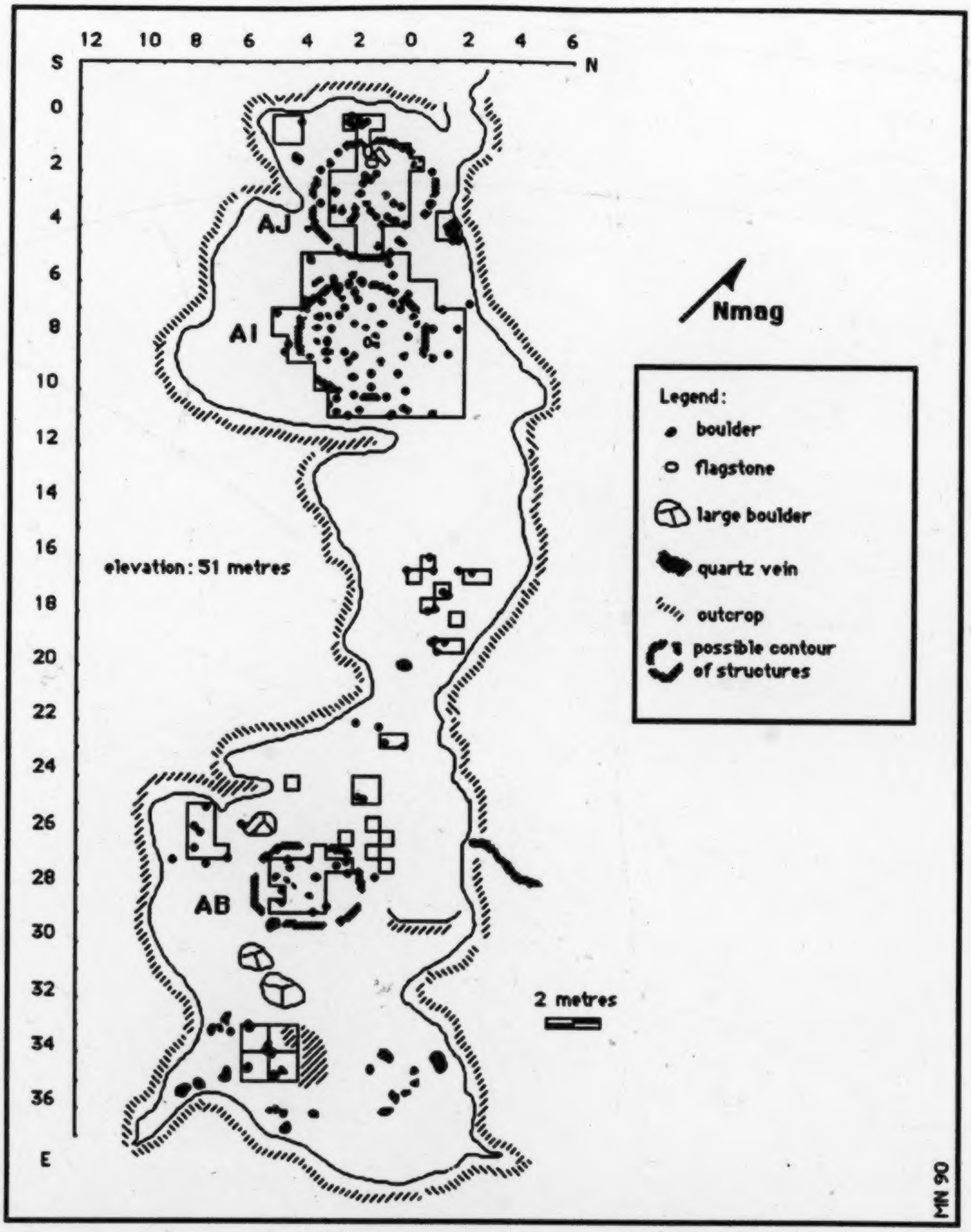

12
10
8
6
4
2
0
2
4
6
S
N
E
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
AJ
AI
AB
elevation: 51 metres
Nmag
Legend:
boulder
flagstone
large boulder
quartz vein
outcrop
possible contour of structures
2 metres
MN 90

Figure 3.4 Mangiuk site, northeast area (KcFr-7NE): Excavated units

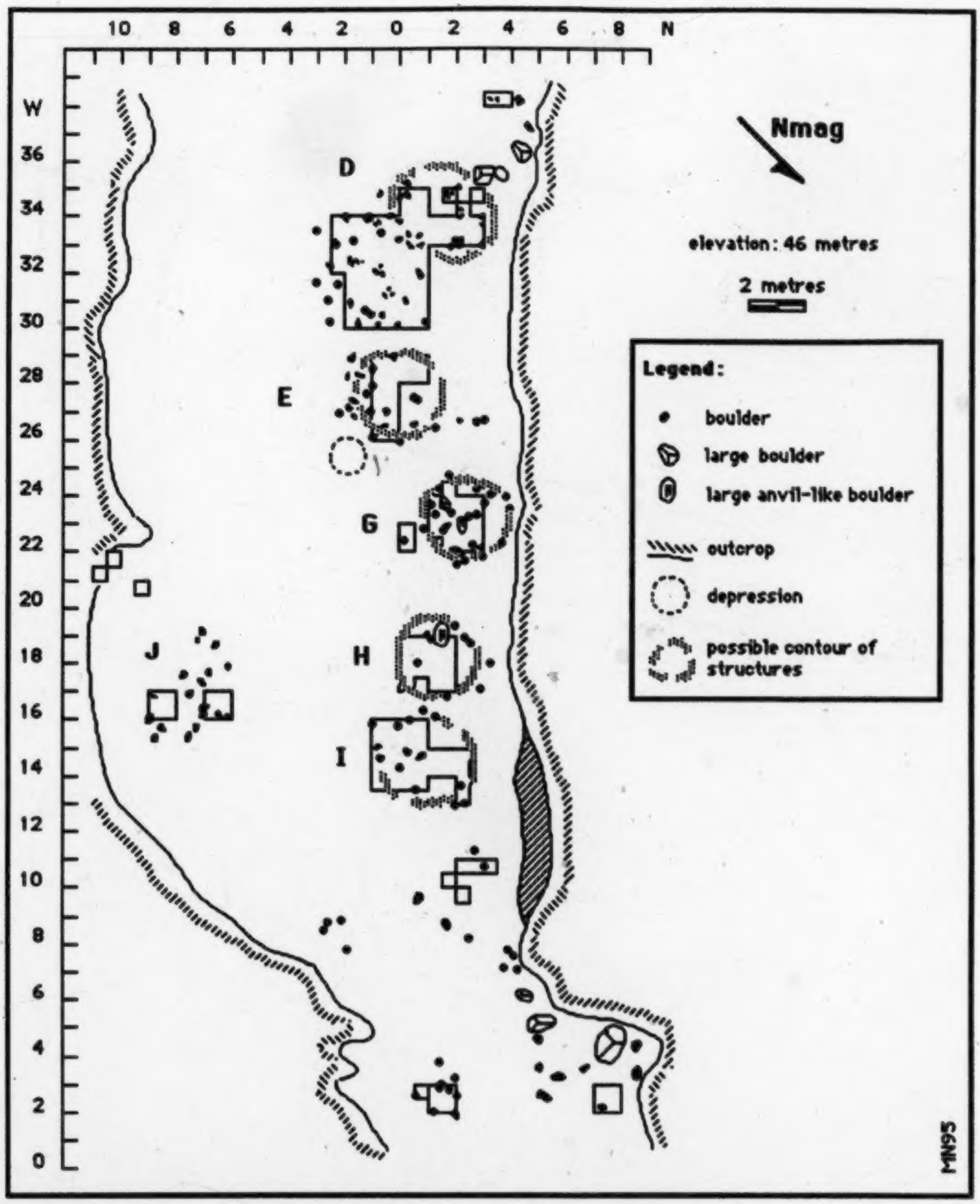

10
8
6
4
2
0
2
4
6
8
N
W
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
D
E
G
H
I
J
Nmag
elevation: 46 metres
2 metres
Legend:
boulder
large boulder
large anvil-like boulder
outcrop
depression
possible contour of structures
MN95

Figure 3.5 Mangiuk site, north area (KcFr-7N): Excavated units

chert were found in both areas of the site. It is, however, very difficult to know if each of the three habitation structures excavated in the northeast area and the five excavated in the north area were occupied simultaneously. Third, the distribution of two types of uncommon chert at both areas was considered to be a justification of association between each excavated structure. These two types were a black translucent chert and a banded chert. It was assumed that the presence of these chert types at individual structures would indicate that the latter were occupied at the same time by people sharing raw material or at different times by people having access to the same source of raw material. In both scenarios, the presence of these raw materials would indicate that the inhabitants of the site had similar knowledge and use of lithic sources and very likely that they belonged to the same cultural tradition.

The association of the two types of chert in all but one structure (structure G) was interpreted as reflecting occupations of both areas of the Mangiuk site by people sharing a similar cultural background. It remains difficult to assess if the five structures containing banded chert (AI, AJ, D, E and I) were occupied all at once by individual families or if the site was revisited during the Pre-Dorset period.

Raw materials and artifact distributions

Lithic artifacts numbered 3010 among which 95.6% (N=2877) came from debitage and 4.4% (N=133) from worked or utilized objects. The most common raw material was chert (96.6%). It was followed by four kinds of quartz, which together represent 2.3% of the assemblage. Other raw materials included quartzite, shale and siltstone.

In the Mangiuk assemblage, the most abundant tools are the burins which represent 24.8% of all the tools (Table 3.3). Burins were also the most numerous tools found by Taylor at the Mangiuk site, even if his total number of artifacts was only 29 (Taylor 1962a:82). In our assemblage of lithic objects worked or utilized, burins are followed by endblades (19.5%), retouched/utilized flakes (15.8%) and modified microblades (15.0%).

As mentioned in Chapter 2, technological types of burins were differentiated for each site to verify if patterns could be associated with each chronological period. Two types of burins were found at the Mangiuk site: expedient burins and spalled burins. The spalled burins were the most numerous representing 63.6% (N=21) of the total number of burins (N=33). However, when the areas are compared, the percentages of spalled burins are different. Thus, in the northeast area, spalled burins comprise 73.9% (N=17) of all the burins from this section of the site (N=23). In contrast, spalled burins constitute only 33.3% (N=2) of all the burins on the north area (N=9). When the percentages of expedient and spalled burins are compared for each structures (Table 3.5 and Figure 3.11), four of the six structures contain both kind of burins. The highest concentration of burins is found in structure AI, which, as will be explained below, was probably a workshop area to make and repair tools.

Activity areas

The spatial distribution of debitage and tools allows us to comment on the habitation structures and the activities that took place there. The highest concentration of debitage was found in structure AI of the northeast area (Figure 3.4) and structure D of the north area (Figure 3.5). In the latter case, most of the debitage was located in front and near what was very likely the entrance of this tent. In the northeast area, the concentrations of lithic tools were also high near the possible entrance of structure AI, and in structure AB. The small concentration of debitage and lithic tools in all but two structures (AI and D) might indicate that the latter were the main areas where flintknapping took place while the other structures were mostly used for sleeping and possibly for cooking. The last point would be very difficult to prove since no hearth or lamp remains were excavated and only one seal bone was found in north area (KcFr-7N). Furthermore, because the bone was on the surface and showed signs of heavy weathering on the exposed surface, its association with the site is dubious as it could have been brought by a carnivore more recently.

The fact that both structures AI and D were bigger in size than the other ones might also indicate that they were used by more people. These structures could have been workshop areas where tools were produced and repaired. The closest analogy would be the *kazigi* of Alaska. However, Larson's (1991) cautionary tale on the strict association of *kazigi* with male associated activities is well taken. In effect, structures AI and D were likely used by both sexes and their function was probably not restricted to a workshop area. The range of tools associated with both structures confirms that last point (Table 3.4): when the percentages of the major lithic tools classes are compared between structures, two patterns emerged.

In the first pattern, shared by structures AB, E and H, there is a high percentage of modified microblades, followed by endblades/sideblades, and by burins (Figure 3.10). Structures E and H have exactly the same percentages, while structure AB has similar ones to those two assemblages. If modified microblades were used for fine cutting (see Maxwell 1974, 1985), then their high representation would indicate that sewing took place in structures AB, E, and H. However, if Renouf (1994) is correct in associating microblades with butchering activities, then they might indicate that such activities took place in the same structures (AB, E and H). The absence of needles, awls, and endscrapers that would have been also used for sewing, would favour the latter interpretation. Hunting implements (i.e., endblades/sideblades) and manufacturing tools (i.e., burins) were also found in these structures. It is difficult to know if the tools were kept (and possibly repaired) in these structures or if they were manufactured there. The fact that these structures contained little debitage would favour the former. Nevertheless, the presence of burins could indicate that organic tool components such as handles, shafts, or harpoons, were produced in these structures.

The second pattern of tool distribution is shared by structures AI and D. It consists of a high percentage of endblades/sideblades followed by burins and modified microblades (Figure 3.10). The high frequencies of these tool classes and their associated large amount of debitage substantiate the interpretation that structures AI and D were workshop areas where hunting gear was produced. Dissimilarities between structures AI and D are only found in the percentages of bifaces/knives and scrapers. It should be noted that although structure AI had more bifaces/knives than structure D, they represent the highest percentage in the latter structure. Scrapers were found only in structure AI where they comprised 5.1% of the tools. Finally, since the two patterns of tool distribution were found in both areas of the Mangiuk site, they reinforce the hypothesis that both locations were occupied by the same group of people or at least by people performing the very same kind of activities. This does not mean that the site was occupied only once; although the latter is a possibility, the Mangiuk site was probably occupied several times by the same people, culturally speaking.

Artifacts were also individually plotted in maps to better understand the activities that took place at the Mangiuk site. For reasons outlined in Chapter 2, unmodified microblades were included with the debitage (Table 3.2). Most of the modified microblades and retouched/utilized flakes were found outside structure AI, near the possible entrance, while most of the burins, burin spalls, endblades/sideblades were found inside the structure. This distribution indicates that hunting gear was produced inside the tent while activities related to food preparation and clothing manufacture took place outside. Faint traces of charcoal were found near the entrance of tent AI and would thus confirm the preparation of food outside the tent. Here, it is tempting to associate the preparation of hunting gear with men's activities and preparation of food and clothing with women's activities and thus separate both sexes in term of their working areas. This might have been the case in structure AI; however, this dichotomy does not appear in the distribution of tools associated with structure AB, where modified microblades and retouched/utilized flakes were found inside the tent.

In the case of structure D, modified microblades and retouched/utilized flakes were found inside the structure while burins and burin spalls, endblades and bifaces/knives were found outside the structure, thus showing the opposite pattern to what was found at

Table 3.1 Mangiuk site (KcFr-7): Raw materials

	Northeast area (KcFr-7 NE)				North area (KcFr-7N)				KcFr-7NE + KcFr-7N			
Raw materials	N	%	gr	%	N	%	gr	%	N	%	gr	%
chert	1429	95.1	369.2	36.1	1478	98.1	291.1	68.9	2907	96.6	660.3	45.7
quartz												
coarse	19	1.3	237.6	23.2	4	0.3	95.7	22.6	23	0.8	333.3	23.1
crystal	10	0.7	8.5	0.8	14	0.9	2.9	0.7	24	0.8	11.4	0.8
hyaline	13	0.9	363.4	35.5	6	0.4	28.1	6.6	19	0.6	391.5	27.1
milky	2	0.1	0.5	0.0	1	0.1	3.4	0.8	3	0.1	3.9	0.3
quartz totals	*44*	*2.9*	*610*	*59.7*	*25*	*1.7*	*13*	*3.1*	*69*	*2.3*	*623.0*	*43.1*
quartzite	4	0.3	7.5	0.7	0	0.0	0.0	0.0	4	0.1	7.5	0.5
shale	24	1.6	32.5	3.2	4	0.3	1.5	0.4	28	0.9	34.0	2.4
siltstone	2	0.1	3.1	0.3	0	0.0	0.0	0.0	2	0.1	3.1	0.2
Totals	1503	100.0	1022.3	100.0	1507	100.0	422.7	100.0	3010	100.0	1445.0	100.0

Table 3.2 Mangiuk site (KcFr-7): Technological classes of lithic artifacts

	Northeast area (KcFr-7 NE)				North area (KcFr-7N)				KcFr-7NE + KcFr-7N			
Lithic artifacts	N	%	gr	%	N	%	gr	%	N	%	gr	%
Debitage												
burin spalls	46	3.1	5.6	0.5	32	2.1	2.9	0.7	78	2.6	8.5	0.6
core fragments	25	1.7	598.4	58.5	10	0.7	142.7	33.8	35	1.2	741.1	51.3
flakes and shatters	1332	88.6	305.5	29.9	1422	94.4	190.0	44.9	2754	91.5	495.5	34.3
microblade core	0	0.0	0.0	0.0	1	0.1	9.8	2.3	1	0.0	9.8	0.7
unmodified microblades	5	0.3	1.0	0.1	4	0.3	2.1	0.5	9	0.3	3.1	0.2
Modified flakes and microblades												
modified microblades	14	0.9	5.6	0.5	6	0.4	5.4	1.3	20	0.7	11.0	0.8
retouched/utilized flakes	15	1.0	15.3	1.5	6	0.4	20.8	4.9	21	0.7	36.1	2.5
Bifaces												
bifaces	2	0.1	17.8	1.7	2	0.1	1.9	0.4	4	0.1	19.7	1.4
endblades	20	1.3	9.2	0.9	6	0.4	2.9	0.7	26	0.9	12.1	0.8
endblade preforms	1	0.1	0.5	0.0	1	0.1	4.5	1.1	2	0.1	5.0	0.3
endscraper	0	0.0	0.0	0.0	1	0.1	3.4	0.8	1	0.0	3.4	0.2
knives	5	0.3	11.6	1.1	4	0.3	24.6	5.8	9	0.3	36.2	2.5
sideblades	9	0.6	4.9	0.5	0	0.0	0.0	0.0	9	0.3	4.9	0.3
sidescrapers	3	0.2	7.7	0.8	0	0.0	0.0	0.0	3	0.1	7.7	0.5
Burins	24	1.6	37.7	3.7	9	0.6	9.2	2.2	33	1.1	46.9	3.2
Miscellaneous												
drills	1	0.1	0.4	0.0	1	0.1	0.5	0.1	2	0.1	0.9	0.1
gravers	1	0.1	0.8	0.1	1	0.1	1.0	0.2	2	0.1	1.8	0.1
unid. tool fragment	0	0.0	0.0	0.0	1	0.1	1.0	0.2	1	0.0	1.0	0.1
Totals	1503	100.0	1022.3	100.0	1507	100.0	422.7	100.0	3010	100.0	1445.0	100.0

Debitage	N	%	gr	%	N	%	gr	%	N	%	gr	%
Totals	1408	93.7	910.5	89.1	1469	97.5	347.5	82.2	2877	95.6	1258.0	87.1

Worked or utilized lithic objects	N	%	gr	%	N	%	gr	%	N	%	gr	%
Totals	95	6.3	111.8	10.9	38	2.5	75.2	17.8	133	4.4	187.0	12.9

Note: All weights in gram (gr).

Table 3.3 Mangiuk site (KcFr-7): Frequencies and % of debitage and worked/utilized lithic objects

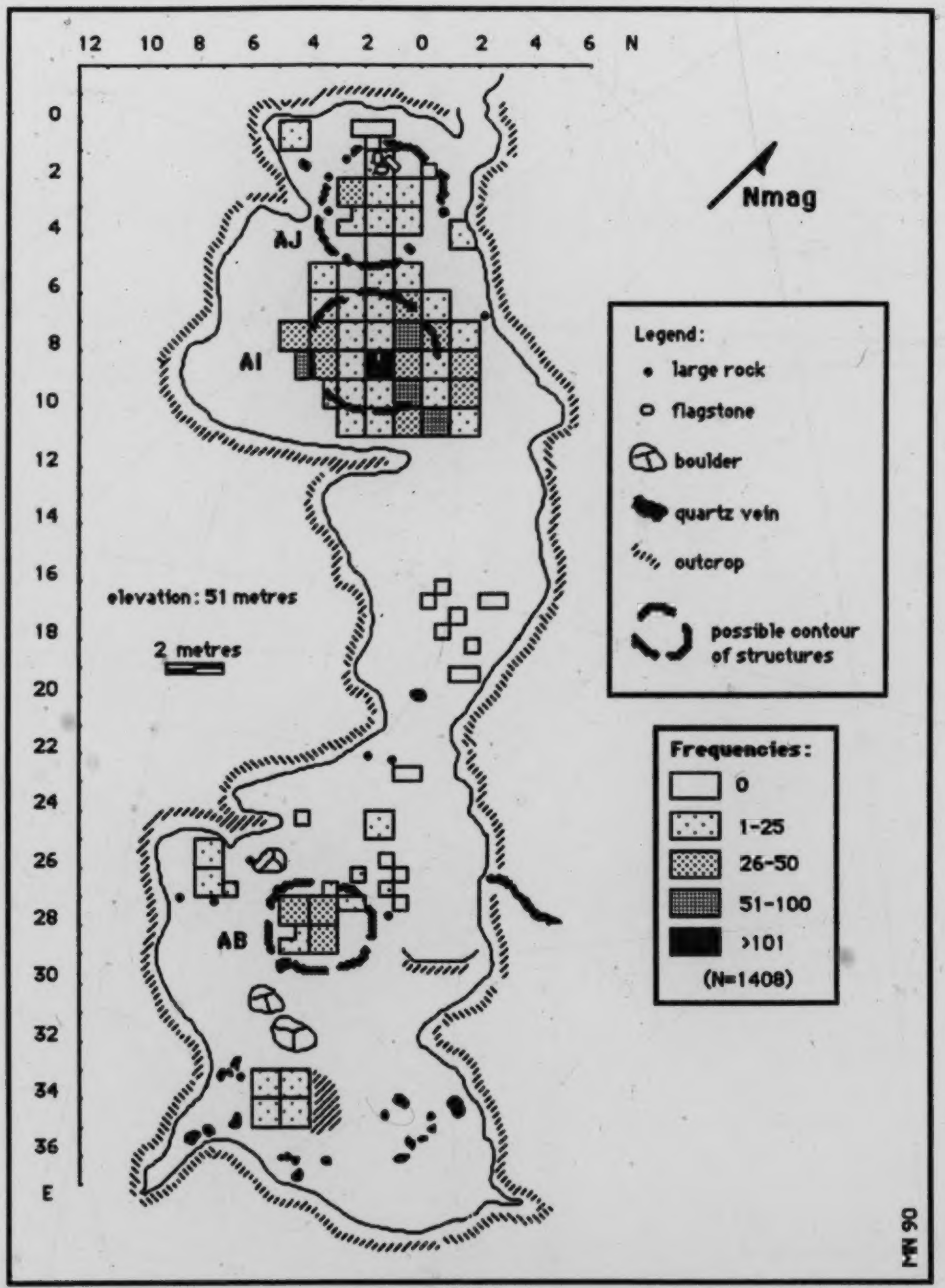
	KcFr-7 NE		KcFr-7N		KcFr-7N+ KcFr-7NE	
Lithic artifacts	N	%	N	%	N	%
Debitage						
flakes and shatters	1332	94.6	1422	96.8	2754	95.7
burin spalls	46	3.3	32	2.2	78	2.7
core fragments	25	1.8	10	0.7	35	1.2
unmodified microblades	5	0.4	4	0.3	9	0.3
microblade core	0	0.0	1	0.1	1	0.0
Totals	1408	100.0	1469	100.0	2877	100.0
Worked or utilized lithic objects						
burins	24	25.3	9	23.7	33	24.8
endblades	20	21.1	6	15.8	26	19.5
retouched/utilized flakes	15	15.8	6	15.8	21	15.8
modified microblades	14	14.7	6	15.8	20	15.0
knives	5	5.3	4	10.5	9	6.8
sideblades	9	9.5	0	0.0	9	6.8
bifaces	2	2.1	2	5.3	4	3.0
sidescrapers	3	3.2	0	0.0	3	2.3
drills	1	1.1	1	2.6	2	1.5
endblade preforms	1	1.1	1	2.6	2	1.5
gravers	1	1.1	1	2.6	2	1.5
endscraper	0	0.0	1	2.6	1	0.8
unid. tool fragment	0	0.0	1	2.6	1	0.8
Totals	95	100.0	38	100.0	133	100.0

Table 3.4 Mangiuk site (KcFr-7): Major lithic tool classes per structure

Majot lithic tool classes	**Habitation structures/activity areas**																			
	KcFr-7NE								KcFr-7N											
	AB		AI		AJ		D		E		G		H		I		Whole site	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
bifaces, knives	0	0.0	4	6.8	2	33.3	3	30.0	0	0.0	0	0.0	0	0.0	3	33.3	13	10.4
burins	2	18.2	16	27.1	1	16.7	2	20.0	1	25.0	0	0.0	1	25.0	4	44.4	33	26.4
endblades, sideblades	3	27.3	21	35.6	3	50.0	3	30.0	1	25.0	0	0.0	1	25.0	1	11.1	35	28.0
modified microblades	5	45.5	8	13.6	0	0.0	2	20.0	2	50.0	0	0.0	2	50.0	0	0.0	20	16.0
retouched/utilized flakes	1	9.1	7	11.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	21	16.8
scrapers	0	0.0	3	5.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	11.1	3	2.4
Totals	11	100.0	59	100.0	6	100.0	10	100.0	4	100	0	0	4	100.0	9	100.0	125	100.0

Table 3.5 Mangiuk site (KcFr-7): Types of burins per structure

	Habitation structures/activity areas																	
	KcFr-7NE			KcFr-7N														
Burins	AB		AI		AJ		D		E		G		H		I		Whole site	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
expedient burins	0	0.0	5	31.3	0	0.0	1	50.0	1	50.0	0	0.0	1	100.0	3	75.0	12	38.7
spalled burins	2	100.0	11	68.8	1	100.0	1	50.0	1	50.0	0	0.0	0	0.0	1	25.0	19	61.3
						0.0												
Totals	2	100.0	16	100.0	1	100.0	2	100.0	2	100.0	0	0.0	1	100.0	4	100.0	31	100.0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0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
E
AJ
AI
AB
Nmag
elevation: 51 metres
2 metres
Legend:
large rock
flagstone
boulder
quartz vein
outcrop
possible contour of structures
Frequencies:
0
1-25
26-50
51-100
>101
(N=1408)
MN 90

Figure 3.6 Mangiuk site, northeast area (KcFr-7NE): Debitage distribution

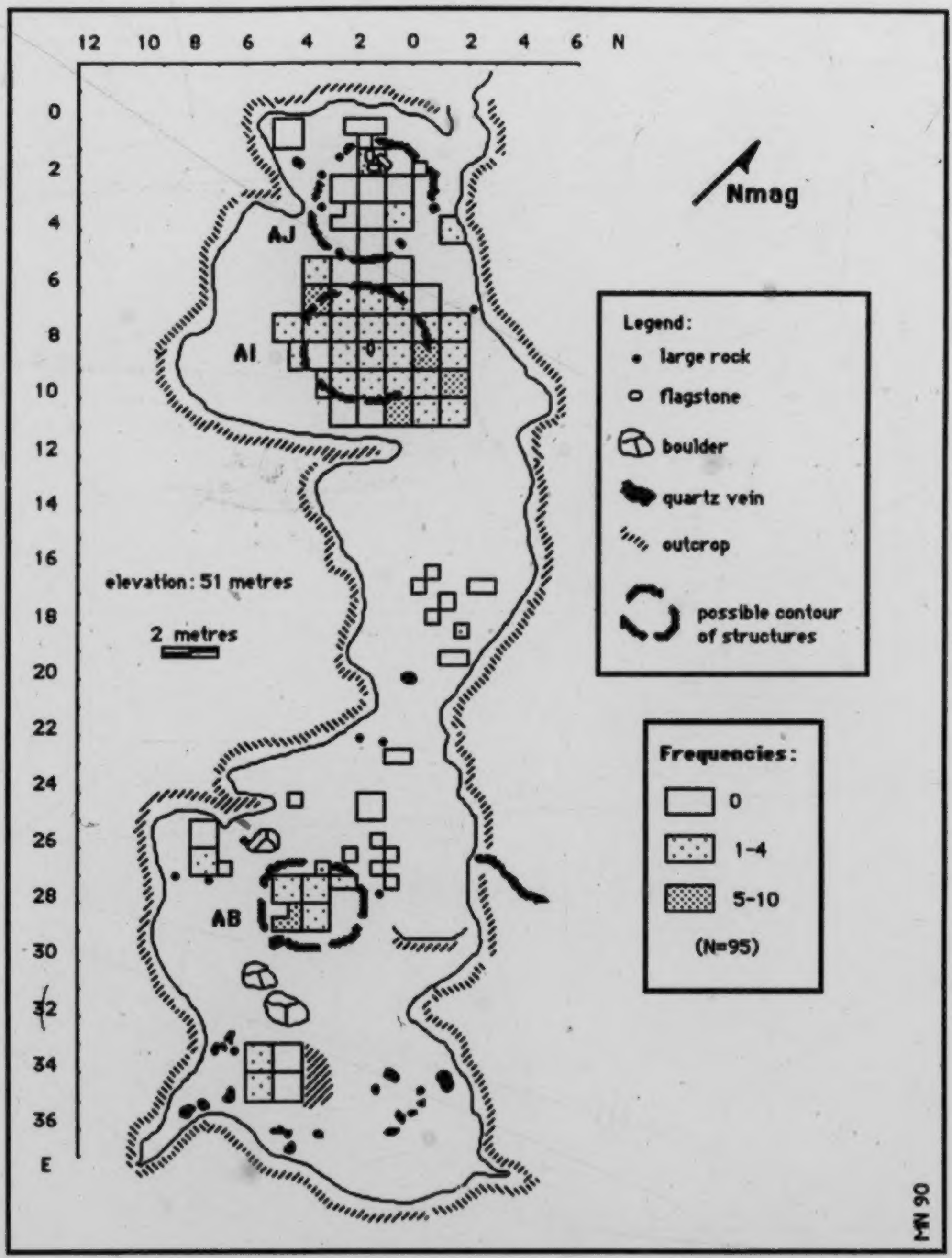

12 10 8 6 4 2 0 2 4 6 N
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
E
Nmag
AJ
AI
AB
elevation: 51 metres
2 metres
Legend:
large rock
flagstone
boulder
quartz vein
outcrop
possible contour of structures
Frequencies:
0
1-4
5-10
(N=95)
MN 90

Figure 3.7 Mangiuk site, northeast area (KcFr-7NE): Lithic tools distribution

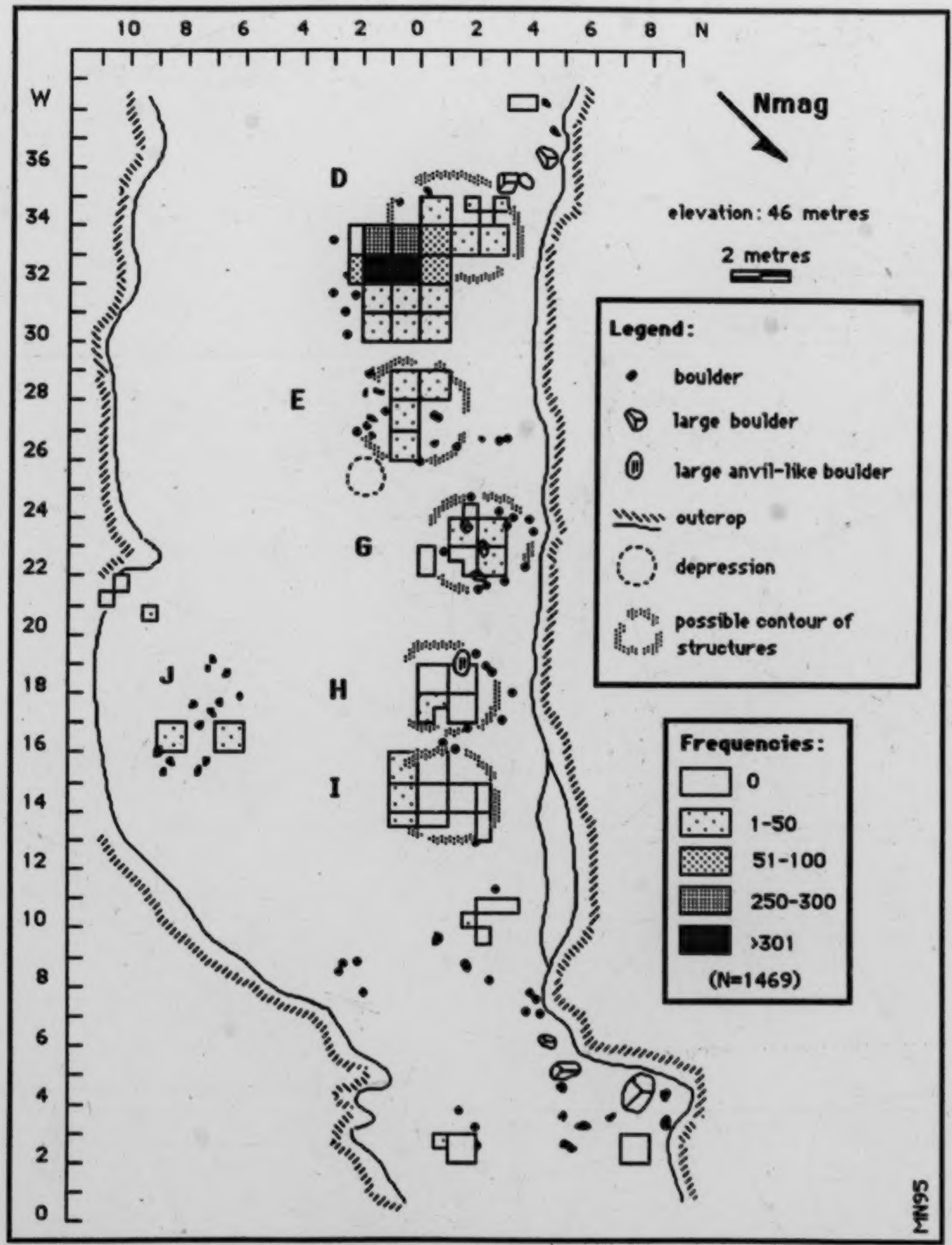

10 8 6 4 2 0 2 4 6 8 N
W
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Nmag
elevation: 46 metres
2 metres
D
E
G
H
I
J
Legend:
boulder
large boulder
large anvil-like boulder
outcrop
depression
possible contour of structures
Frequencies:
0
1-50
51-100
250-300
>301
(N=1469)
MN95

Figure 3.8 Mangiuk site, north area (KcFr-7N): Debitage distribution

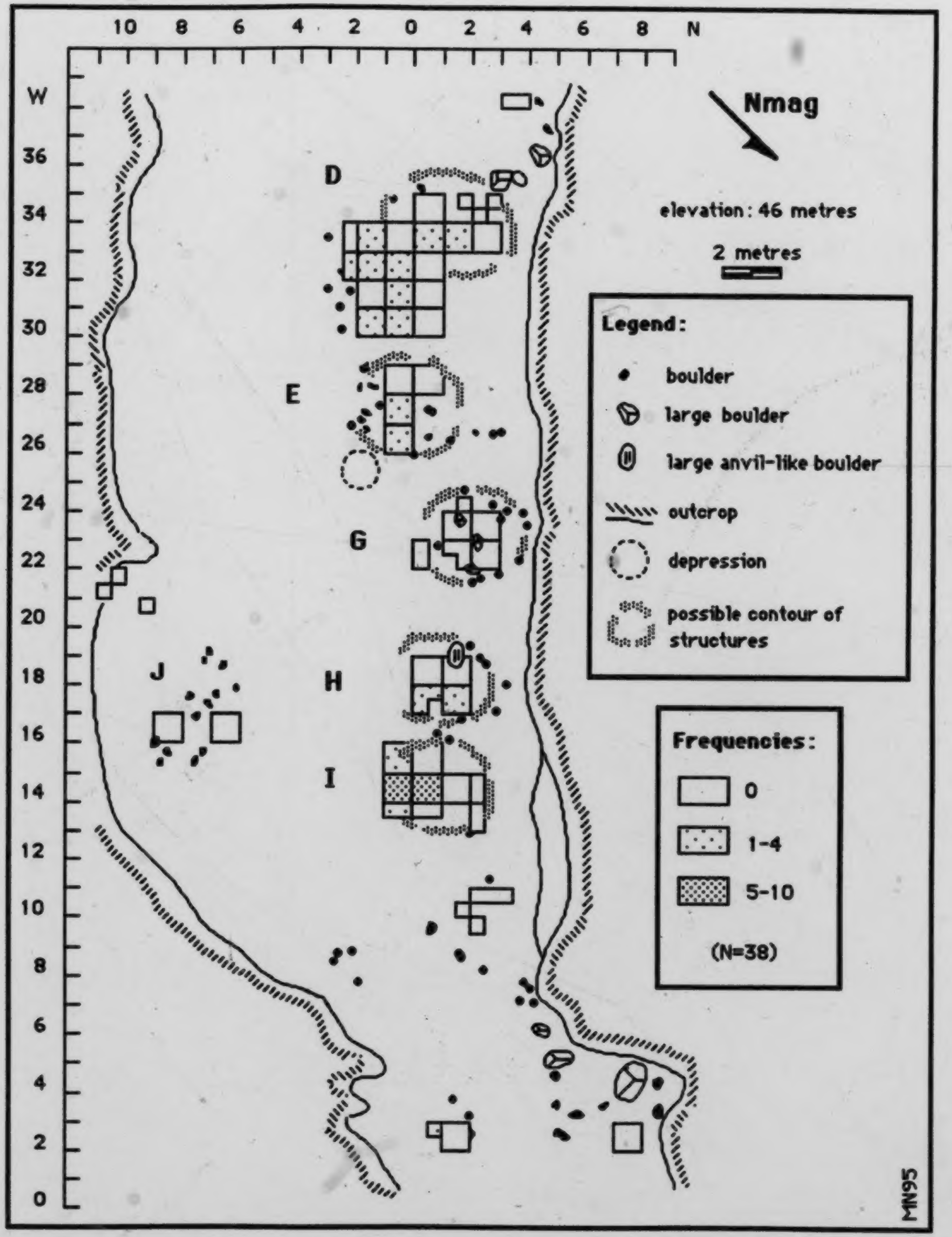

10
8
6
4
2
0
2
4
6
8
N
W
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
D
E
G
H
I
J
Nmag
elevation: 46 metres
2 metres
Legend:
boulder
large boulder
large anvil-like boulder
outcrop
depression
possible contour of structures
Frequencies:
0
1-4
5-10
(N=38)
MN95

Figure 3.9 Mangiuk site, north area (KcFr-7N): Lithic tools distribution

Figure 3.10 Mangiuk site (KcFr-7): Major lithic classes for structures AB, AI, D, E and H

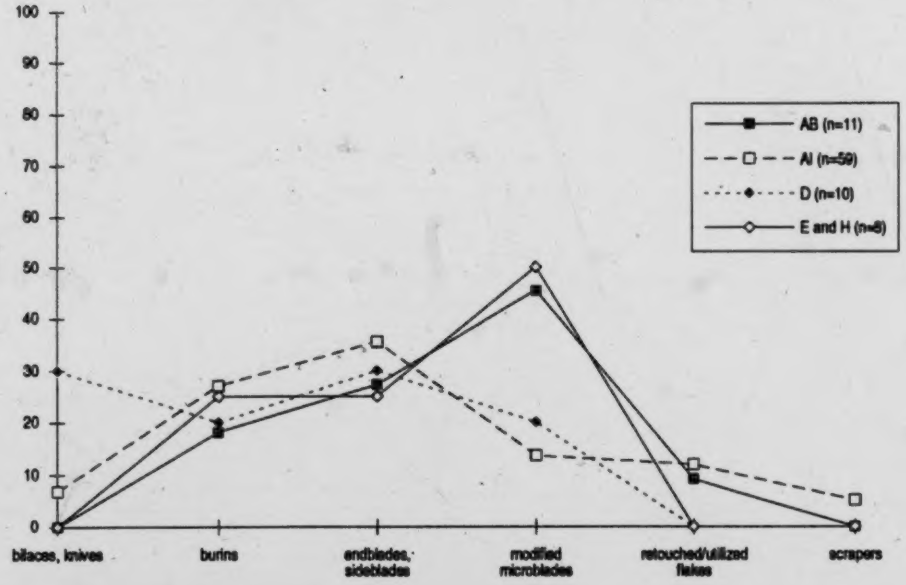
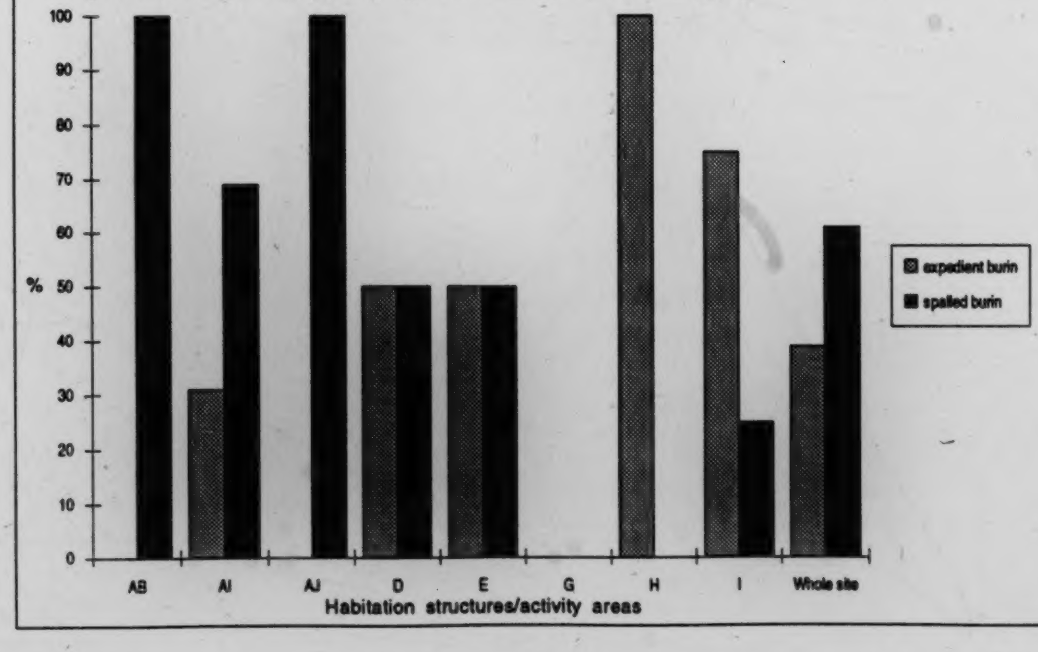


Figure 3.11 Mangiuk site (KcFr-7): Types of burins per structure/activity area



structure AI. There are two ways to interpret this situation: (1) most of the activities related to tool production and maintenance took part outside the tent; or (2) that in parallel to these activities, preparation of food (from the finding of knives outside the tent) was also undertaken.

Since the northeast area of the Mangiuk site is more elevated and provides an excellent view of the sea, it is quite likely that tents were set there to work on hunting implements while looking for sea mammals once in a while. The natural shelter provided by the rocky wall west of the north area would have been used to set up tents where little activity took place aside from sleeping. Furthermore, with the exception of structure AI and D, the relatively small assemblages associated with the other structures indicate that the north and northeast areas were not occupied very long, maybe only for a couple of days or a week at the most.

Tivi Paningayak, area B (KcFr-8B)

Description

The site Tivi Paningayak (KcFr-8) was identified by Aménatech (1985) in 1984. It is located in a small valley about 900 metres north of the village of Ivujivik and 150 metres from the present shoreline. Its coordinates are 62°25'31"N and 77°55'04"W. The site is composed of three areas: A, B and C. Only areas A and B were excavated in 1989. Area B, the focus of this section and which I called KcFr-8B, is at about 32.5 metres above sea level. It is part of a slope made of gravel and sheltered in the west by a rocky wall about six metres high (Figure 3.12). The area covers 34 metres (north-south) by 15 metres (east-west).

The four tent rings originally identified by Aménatech (1985) were excavated in 1989 for a total of 56.5 square metres. These are structures BA, BB, BC and BD. Their dimensions vary from 2 to 4 metres in diameter and it seems that structure BD was part of structure BC. The use of heavy boulders in the construction of these structures contrasts with the smaller rocks usually associated with Pre-Dorset tent rings. Furthermore, there was no indication of mid-passage features that are also frequently associated with Pre-Dorset structures. In the present case in seems likely that the structures were occupied during warm weather and that no hearth was necessary inside the tents.

Another feature (BE) interpreted by Aménatech (1985) as a cache, is located northwest of the site. Testing of this feature yielded no faunal nor cultural remains and its function is thus problematic. The stratigraphy of the site is composed of a first layer of 2 cm of sod, lichen and grass. It is followed by a humus layer from 2 to 5 cm, mixed with small rocks. This is the only level of cultural occupation. The small amount of archaeological material

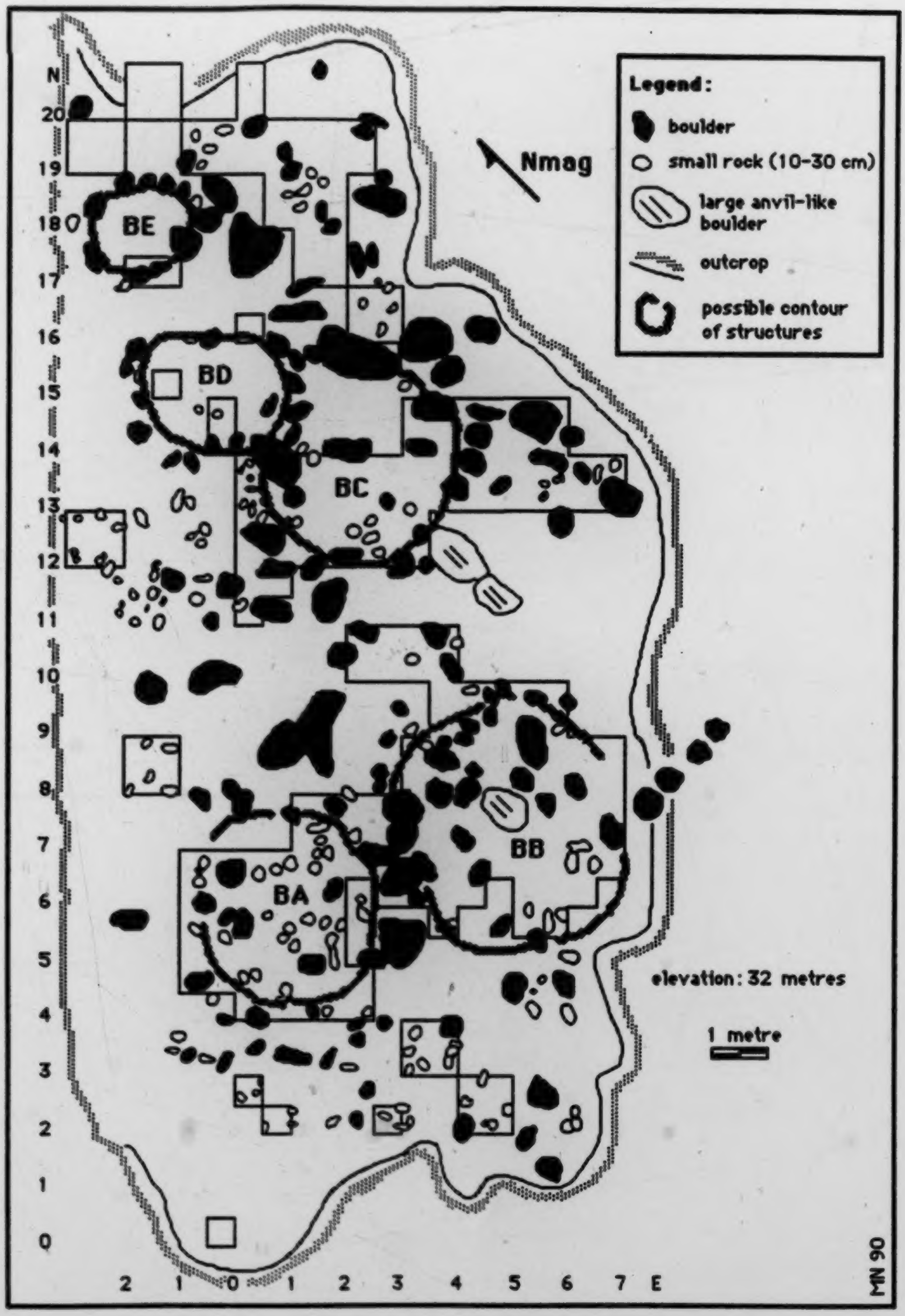

Legend:
boulder
small rock (10-30 cm)
large anvil-like boulder
outcrop
possible contour of structures
Nmag
BE
BD
BC
BB
BA
N
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2 1 0 1 2 3 4 5 6 7 E
elevation: 32 metres
1 metre
MN 90

Figure 3.12 Tivi Paningayak site, area B (KcFr-8B): Excavated units

found at the site indicates that its was occupied for a very short time period, probably less than a week.

Chronology

No suitable organic material was found for radiocarbon dating. However, the style of lithic artifacts (Plates 4-6) suggests that KcFr-8B was occupied by Pre-Dorset people. In structure BC, a small endblade (Plate 5-d) is similar to one found in early Palaeoeskimo sites in Saglek, along the Labrador coast (see Maxwell 1985:102, figure 5.13-e).

Nature of occupations

KcFr-8B comprises the remains of three tents which were circled with large boulders. Structure BB is the largest and it contained a large rectangular boulder that was possibly used as a table. After considering the distribution of lithic material at the site, it seemed that structure BD, which had no artifacts, was part of structure BC. Its small dimensions might indicate that it was a porch to enter structure BC or more likely, an extra room to sleep or to store material and/or food. Structure BE was 1.5 metres in diameter and is too small to have been a tent for a family. It might have been used as a storage room or by children as a play tent. If dogs were present, puppies might have been kept there too.

It is difficult to know if the three tents were occupied at the same time. In the case of the Mangiuk site, the distribution of unusual chert was considered as a mean of establishing that the tents were used contemporaneously. The most uncommon type of chert found in the KcFr-8B assemblage is a translucent one. It was recovered from structures BA, BB and BC. Its presence in all these structures could indicate that the latter were used by people sharing knowledge of the same lithic source. However, since this translucent chert was found in small numbers among all the lithic assemblage, it is more likely that it came from the same core or from tools that were being maintained. This last comment would thus favour a contemporaneous occupation of the three tents. On the other hand, coarse quartz was associated only with structure BB, which could be interpreted as the result of an individual occupation having taking place at a different time than the two other structures.

Raw materials and artifact distributions

At KcFr-8B, 1087 lithic artifacts were found among which 4.1% (N=54) were worked or utilized (Tables 3.6 and 3.7). The most common of the latter category are the burins and the microblades which account for 25% of all worked or utilized lithic objects (Tables 3.8 and 3.9). The most abundant raw material is chert, representing 99.1% of the assemblage (Table 3.6). Other lithic materials present in small quantities were quartz (three types), quartzite, siltstone and shale.

The highest concentration of debitage was found in structure BC. Lesser amounts were found in structure BB (Figure 3.13) where most of the worked and utilized objects were also excavated (Figure 3.14).

Activity areas

The largest tent, structure BB, was the only one associated with burins (N=9). In the absence of burins in the other structures, burin spalls are good indicators that burins were used even if the burins themselves were not discarded or forgotten at the site. Structure BA had two while structure BC had one. These burin spalls are thus evidence that burins were used but certainly not as much as in structure BB. Although the frequencies of tools present in each structure were low in all but structure BB (Table 3.9), percentages of tool classes were compared to look for possible patterns in tools use by the inhabitants of each structure. A small rock with a hole was recovered in structure BB (Plate 6) and was first considered to be an artifact possibly used to start a fire by quickly rotating a wood sick in it (Tivi Paningayak, pers. comm. 1989). However, microscopic examination of the hole did not show any signs of striae or polishing associated with the manufacture or the use of the object. Nevertheless, the peculiar aspect of the rock and its association with structure BB suggests that it was brought there intentionally and was thus considered a manuport, that is, a natural object transported by humans (see Table 3.7).

If the absence of burins at structures BA and BC is compensated by the presence of burin spalls, then the percentages of tool distributions are somewhat similar between structures where modified microblades and endblades/sideblades are the most represented classes. The high concentration of burins within structure BB could indicate that, as in the case of structure AI at the Mangiuk site, one structure was used as a workshop place to make and repair tools. However, the fact that structure BB also contains the highest number of modified microblades (N=7), and of bifaces/knives (N=4), suggests that other activities linked to the preparation of food, and possibly to sewing, were also performed. The two other structures (BA and BC) were associated with few tools and since even the tools from structure BB are relatively low in number, it seems that all three occupations were brief. People probably camped at the site for less than a week.

Only two bones were recovered from the site. Since no bone, antler or ivory tools were found, there may be a preservation problem at that site. Otherwise, the rarity of bones might be explained by a short stay during which people did not discard many bones. If bones were left at the site, they were probably lying on the surface and were destroyed by weathering processes during the last 3000 years.

Table 3.6 Tivi Paningayak site, area B (KcFr-8B): Raw materials

Raw materials	Number	%	Weight (g)	%
chert	1076	99.1	236.8	78.9
quartz				
coarse	3	0.3	16.4	5.5
crystal	1	0.1	0.4	0.1
milky	3	0.3	0.1	0.03
quartz totals	*7*	*0.6*	*17.0*	*5.6*
quartzite	2	0.2	0.5	0.2
siltstone	2	0.2	39.3	13.1
shale	1	0.1	6.5	2.2
Totals	1086	100.0	317.0	100.0

Table 3.7 Tivi Paningayak site, area B (KcFr-8B): Technological classes of lithic artifacts

Lithic artifacts	Number	%	Weight (g)	%
Debitage				
flakes and shatters	1018	93.7	176.0	58.7
unmodified microblades	11	1.0	1.5	0.5
burin spalls	9	0.8	1.0	0.3
cores and core fragments	4	0.4	21.9	7.3
Modified flakes and microblades				
modified microblades	11	1.0	4.1	1.4
retouched/utilized flakes	5	0.5	13.6	4.5
Bifaces				
endblades	6	0.6	7.8	2.6
knives	3	0.3	5.5	1.8
bifaces	2	0.2	7.6	2.5
sideblades	2	0.2	2.1	0.7
sidescrapers	2	0.2	3.0	1.0
Burins	11	1.0	17.2	5.7
Miscellaneous				
manuport	1	0.1	38.4	12.8
unid. tool fragment	1	0.1	0.6	0.2
Totals	1086	100.0	300.0	100.0

Debitage	Number	%	Weight (g)	%
Totals	1042	95.9	200.4	66.8

Worked or utilized lithic objects	Number	%	Weight (g)	%
Totals	44	4.1	99.6	33.2

Table 3.8 Tivi Paningayak site, area B (KcFr-8B): Frequencies and % of debitage and worked/utilized lithic objects

Lithic artifacts	N	%
Debitage		
flakes and shatters	1018	97.7
unmodified microblades	11	1.1
burin spalls	9	0.9
cores and core fragments	4	0.4
Totals	1042	100.0
Worked or utilized lithic objects		
burins	11	25.0
modified microblades	11	25.0
endblades	6	13.6
retouched/utilized flakes	5	11.4
knives	3	6.8
bifaces	2	4.5
sideblades	2	4.5
sidescrapers	2	4.5
manuport	1	2.3
unid. tool fragment	1	2.3
Totals	44	100.0

Table 3.9 Tivi Paningayak site, area B (KcFr-8B): Major lithic tool classes per structure

Lithic tools	Habitation structures							
	BA		BB		BC		Whole site	
	N	%	N	%	N	%	N	%
bifaces, knives	1	25.0	4	16.0	0	0.0	5	11.9
burins	0	0.0	9	36.0	0	0.0	11	26.2
endblades, sideblades	1	25.0	3	12.0	3	37.5	8	19.0
modified microblades	2	50.0	7	28.0	2	25.0	11	26.2
retouched/utilized flakes	0	0.0	1	4.0	2	25.0	5	11.9
sidescrapers	0	0.0	1	4.0	1	12.5	2	4.8
Totals	4	100.0	25	100.0	8	100.0	42	100.0

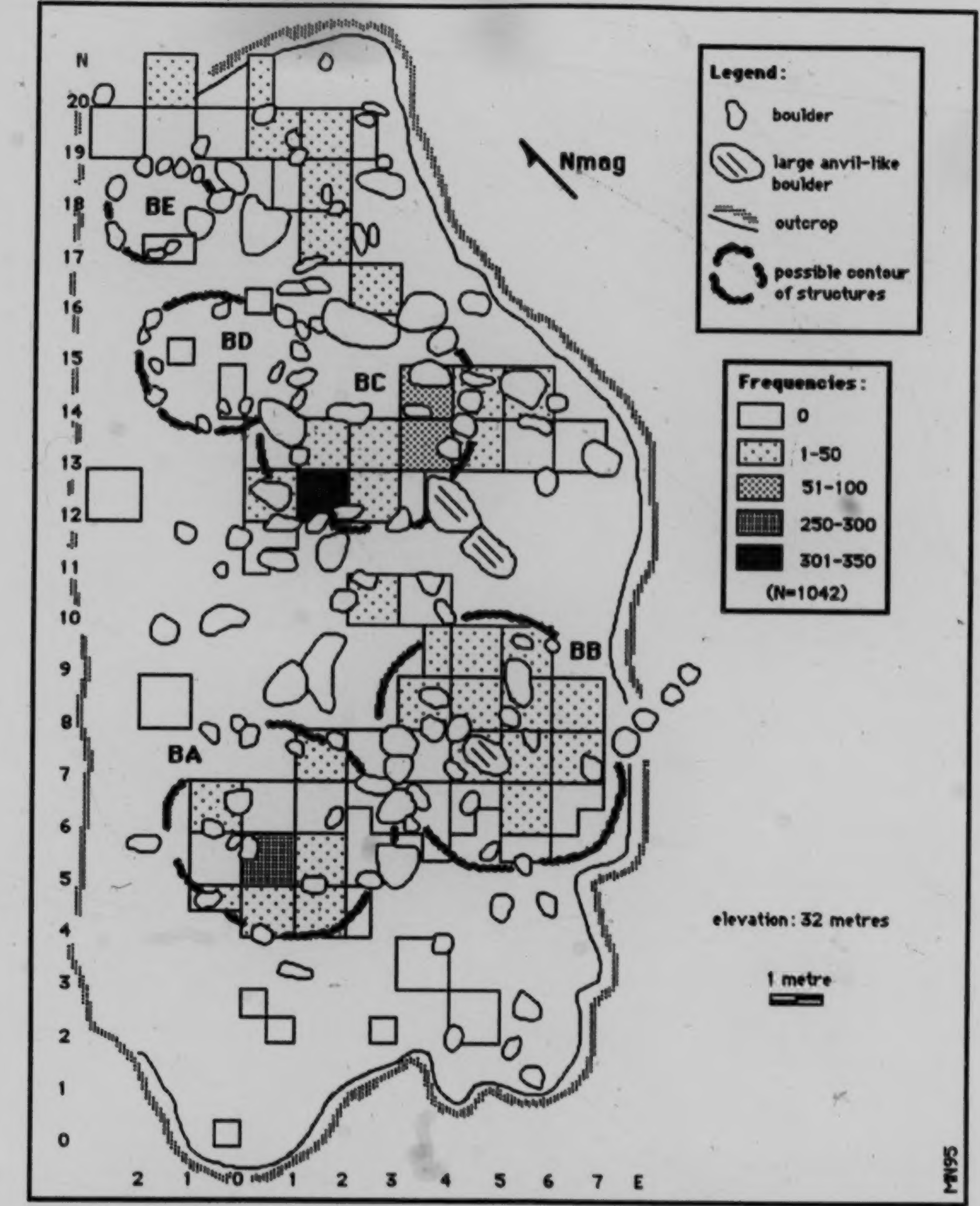

N
Nmag
BE
BD
BC
BB
BA
Legend:
boulder
large anvil-like boulder
outcrop
possible contour of structures
Frequencies:
0
1-50
51-100
250-300
301-350
(N=1042)
elevation: 32 metres
1 metre
MN95
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2
1
0
1
2
3
4
5
6
7
E

Figure 3.13 Tivi Paningayak site, area B (KcFr-8B): Debitage distribution

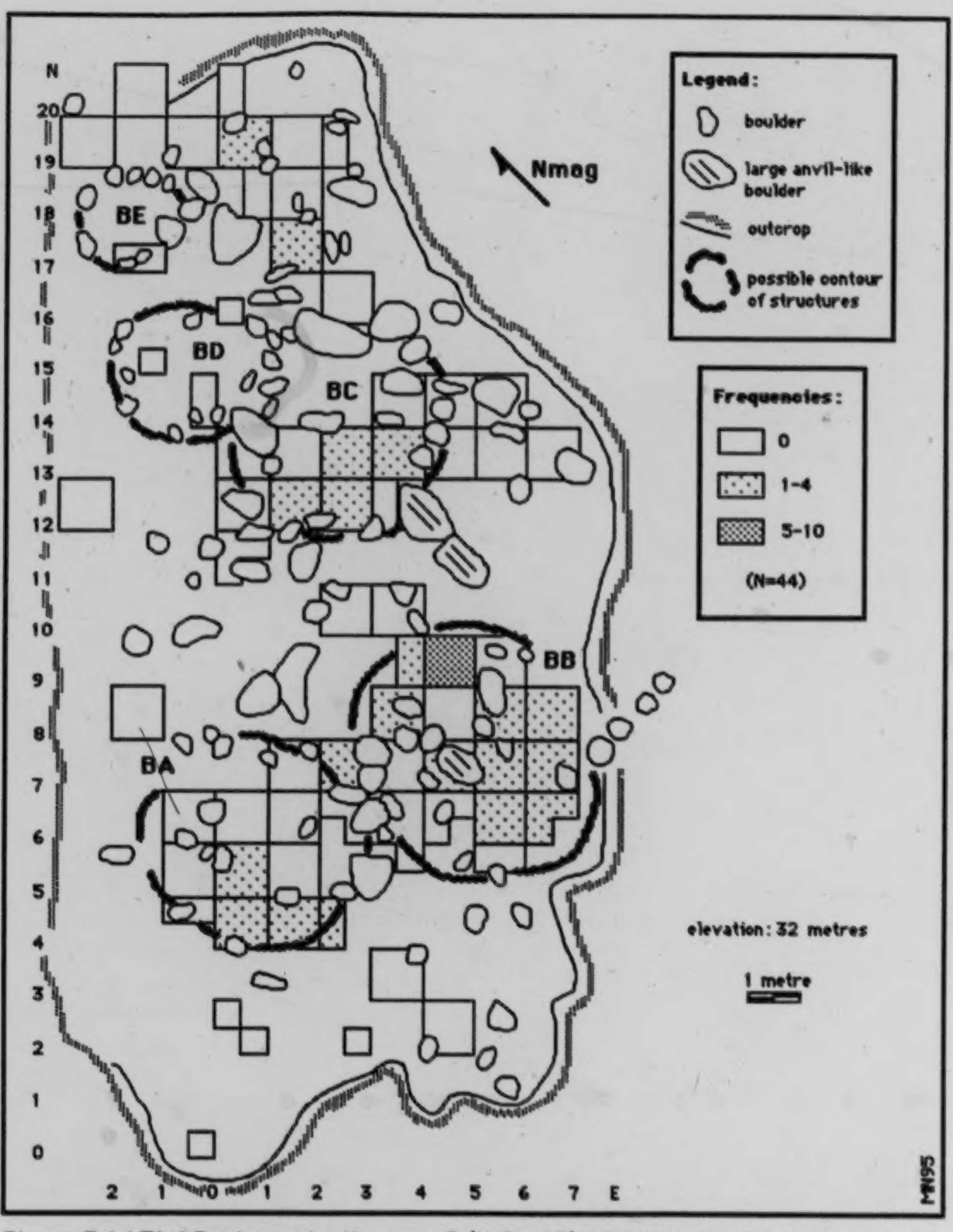

N
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2
1
0
1
2
3
4
5
6
7
E
BE
BD
BC
BB
BA
Nmag
Legend:
boulder
large anvil-like boulder
outcrop
possible contour of structures
Frequencies:
0
1-4
5-10
(N=44)
elevation: 32 metres
1 metre
MN95

Figura 3.14 Tivi Paningayak site, area B (KcFr-8B): Lithic tools distribution

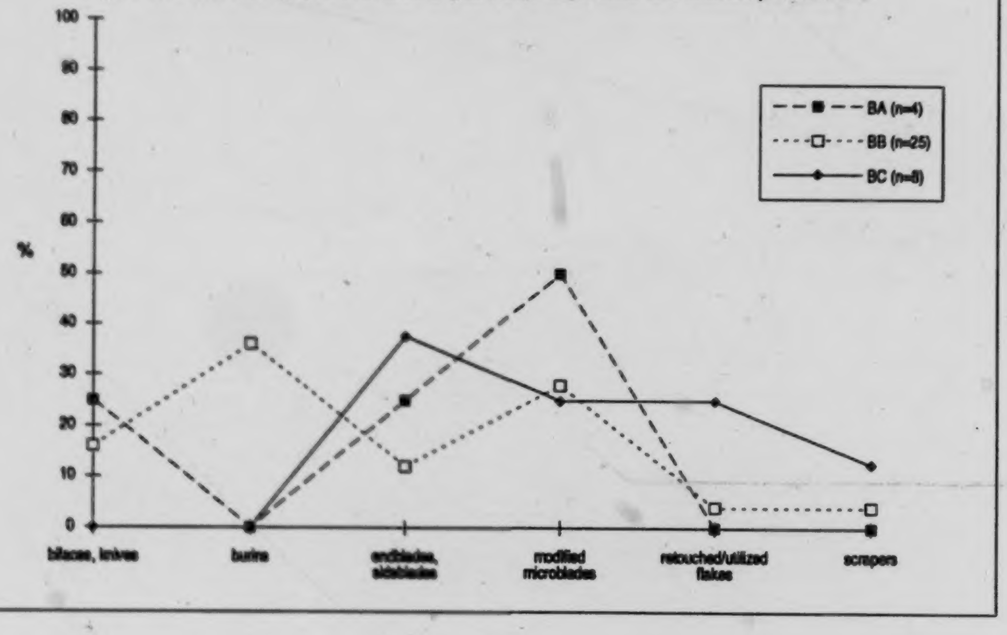


Figure 3.15 Tivi Paningayak site, area B (KcFr-8B): Major lithic tool classes per structure

Pre-Dorset/Dorset transitional sites: Pita (KcFr-5) and Ohituk, area A (KcFr-3A)

Pita (KcFr-5)

Description

The Pita site (KcFr-5, 62°25'15"N and 77°55'39'W) was identified and tested by Taylor in 1959 (1962a:81). It is located on a boulder field now covered with vegetation about 900 metres west of the village of Ivujivik, 300 metres from the present shoreline and 37 metres above sea level. A lake existed south of the Pita site but during the construction of an airport in the 1980s it was drained. When the site was revisited in 1984, its dimensions were estimated at about 90 metres east-west by 55 metres north-south (Aménatech 1985:39).

In 1959, Taylor did not notice any structures but in 1984 eight habitation structures were identified (Aménatech 1985:41). These were described as five semi-subterranean houses and three tent rings (Figure 3.16). During the 1990 excavation it was difficult to make out the contour of structures among the many boulders. The stratigraphy comprises an upper layer made of sod, lichen and grass, measuring 2 to 15 cm thick. This layer is followed by level 1, a dark brown organic horizon. Level 2 is another organic horizon mixed with sand, small gravel and numerous boulders. Several refitted artifacts that fit between level 1 and 2, suggest that they are not distinct cultural occupations.

Structure A is located in the southwest extremity of the site. It was originally described as a rectangular semi-subterranean structure about 3.5 x 3 metres in size (Aménatech 1985:41) as probably perceived from a change in vegetation at this location. After excavation, the only structural remains were two large flat boulders that were possibly used as tables or as anvils. After excavating part of the structure, it did not appear that the floor had been initially dug in the ground. In effect, the sterile level of the house was found at about the same level of that of the tent structures, indicating that it was not a semi-subterranean structure. It is more likely to have been a tent-like structure surrounded by small walls, no higher than half a metre, made of sod and rocks.

Structure B is located 4 metres north of structure A. By looking at the change in vegetation, it seems to be rectangular in shape with dimensions of about 3.5 x 2.5 metres. As in the case of structure A, it was described as a semi-subterranean structure by Aménatech (1985:41). Partial excavation revealed that it was not semi-subterranean but rather a tent-like structure with small walls of sod and rocks of about 20 to 30 cm in height, as indicated by small concentrations of sod recovered on the north and east walls.

Structure C is located southeast of structure B. Although originally described as a semi-subterranean structure (Aménatech 1985:41), the excavation demonstrated that it was

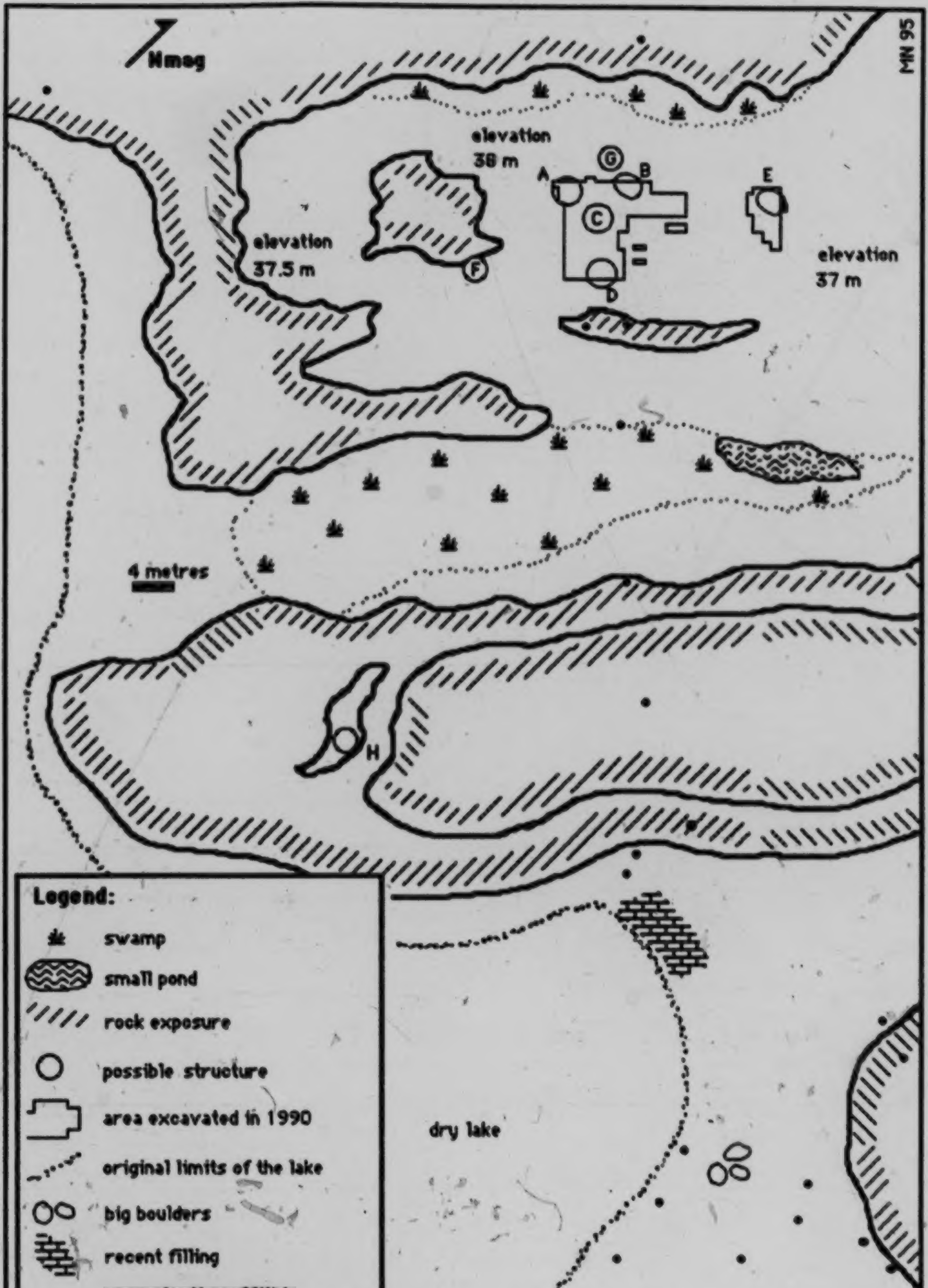

Nmag
MN 95
elevation
38 m
A
G
B
E
C
elevation
37.5 m
F
D
elevation
37 m
4 metres
H
dry lake
Legend:
swamp
small pond
rock exposure
possible structure
area excavated in 1990
original limits of the lake
big boulders
recent filling
concentration of lithic artifacts found on the surface

Figure 3.16 Pita site (KcFr-5)

actually a tent ring of about 3 x 4 metres containing a small hearth. Structure D is in the southeast portion of the area excavated at the Pita site. This structure was also originally described as semi-subterranean (Aménatech 1985:41) but the excavation revealed that it was a tent ring with a small hearth inside. Its dimensions were about 3 x 3.5 metres.

Structure E is in the northwest part of the site, close to the faunal midden. It was possibly a tent ring of about 3 x 2.5 metres. However, the absence of stones in a patterned manner also suggest that is was an open area where human activities linked to tool manufacture and butchering took place.

Four small depressions covered with rocks and containing faunal remains were interpreted as food caches during the excavation (Figure 3.17). A fifth one was identified during the faunal analysis owing to the abundance of recovered faunal material. It is difficult to associate each cache with a specific habitation structure. Tentative associations would link cache pit 1 with structure B, cache pit 2 and 5 with structure C, cache pit 3 with structure D, and cache pit 4 with area E. No cache pit was identified near structure A.

The difference in the architecture of structures A and B, and that of structures C and D (and possibly E), was tentatively associated with different seasons of occupation. Structures A and B may represent cold weather occupation, and structures C, D and E, could have been tents utilized during warmer months. The abundance of archaeological material and the presence of cache pits suggest that the site was occupied for longer periods of time than the Pre-Dorset sites described earlier, possibly for a few weeks or even more. Furthermore and as will be discussed later, it is also possible that the site was used repeatedly by people during the Pre-Dorset/Dorset transition.

Chronology

The general style of lithic artifacts found at the Pita site is closer to Pre-Dorset than Dorset material (Plates 7-23). For example, one endscraper (Plate 11-h) is identical to the one found at the Pre-Dorset Arnapik site on Mansel Island (see Taylor 1968:114, Fig. 18-f). One serrated endblade (Plate 17-a) is very similar to those from the Independence I complex in the High Arctic (e.g., McGhee 1979, Schledermann 1990) and in Greenland (see Knuth 1967). The presence of serrated endblades was also reported by Taylor (1962a, 1968) from his excavations at the Pita and Meeus sites in Ivujivik.

Other tools look very much like those found in transitional sites such as the Avinga site located southern Baffin Island (see Maxwell 1985:124, Fig. 5.22). This is particularly the case for some burins and concave sidescrapers (compare Plates 11 and 21 to Maxwell 1985:124, Fig. 5.22-a and j). On the other hand, the transverse-edged knives are similar to those produced during the Dorset period (compare Plate 9 with Maxwell 1985:145, Fig.

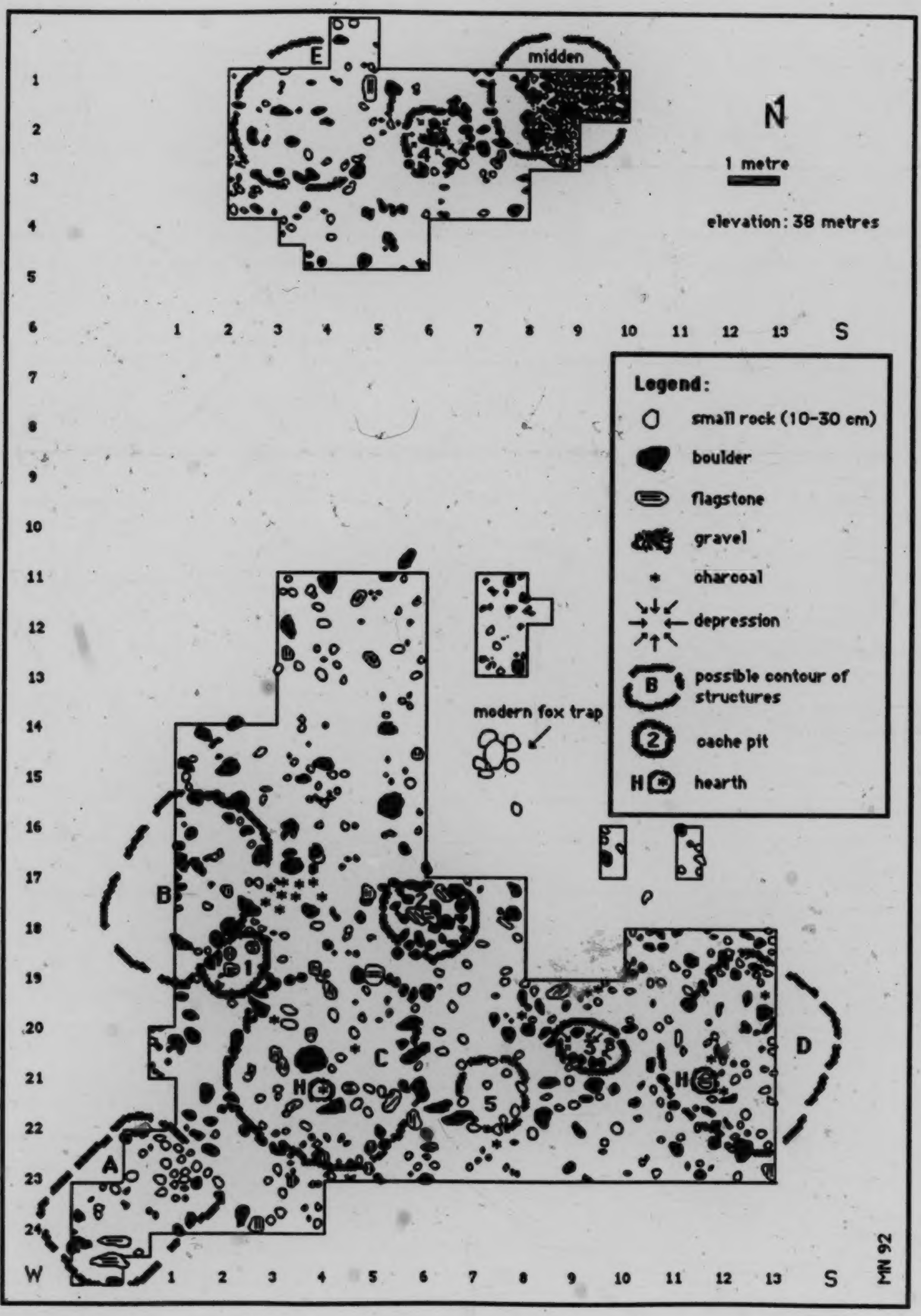

midden
E
4
N
1 metre
elevation: 38 metres
Legend:
small rock (10-30 cm)
boulder
flagstone
gravel
charcoal
depression
possible contour of structures
cache pit
hearth
modern fox trap
A
B
C
D
H
1
2
3
5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
W
S
MN 92

Figure 3.17 Pita site (KcFr-5): Excavated units

6.14-c). However, the small number of burin-like tools (N=4) found at the Pita site contrasts with their greater presence in Dorset sites and would confirm an occupation during the Pre-Dorset/Dorset transition. Unfortunately for stylistic comparison, the only complete harpoon head is atypical and cannot be linked to any particular period (see Plate 28-c).

The stylistic diversity found in the Pita site may indicate that the habitation structures were occupied at different times from the Pre-Dorset to the Dorset periods. However, when artifacts were compared between structures, it appears that they all contain a high diversity in style. This evidence suggests that the site was occupied during the transition between the Pre-Dorset and the Dorset periods. To verify which hypothesis is the most appropriate, radiocarbon dates would need to be obtained for each habitation structure identified at the Pita site. However, due to budget restrictions, only one organic sample was dated through the AMS method. The sample was from willow charcoal collected in the hearth of structure C, located in unit S4W22, level 2. It gave an uncalibrated age of 2580±60 B.P. (Beta-51804). Once calibrated with the intercept method at 1 sigma (Stuiver and Becker 1986), the date is 2755 to 2611 years calibrated B.P. (or 806 to 662 years calibrated B.C.). This date corresponds to an occupation during the Pre-Dorset/Dorset transition. This date would also place the Pita site later than originally suggested by Taylor (1962a). Using a time of occupation of about 3500 B.P., Andrews et al. (1971:21) estimated that the Pita site was located at about 10 metres above the sea level. It is reasonable to assume that if the site was occupied later than 3500 B.P., at around 2800 to 2600 B.P., its location would have been higher than 10 metres above sea level because of isostatic rebound.

Nature of the occupations

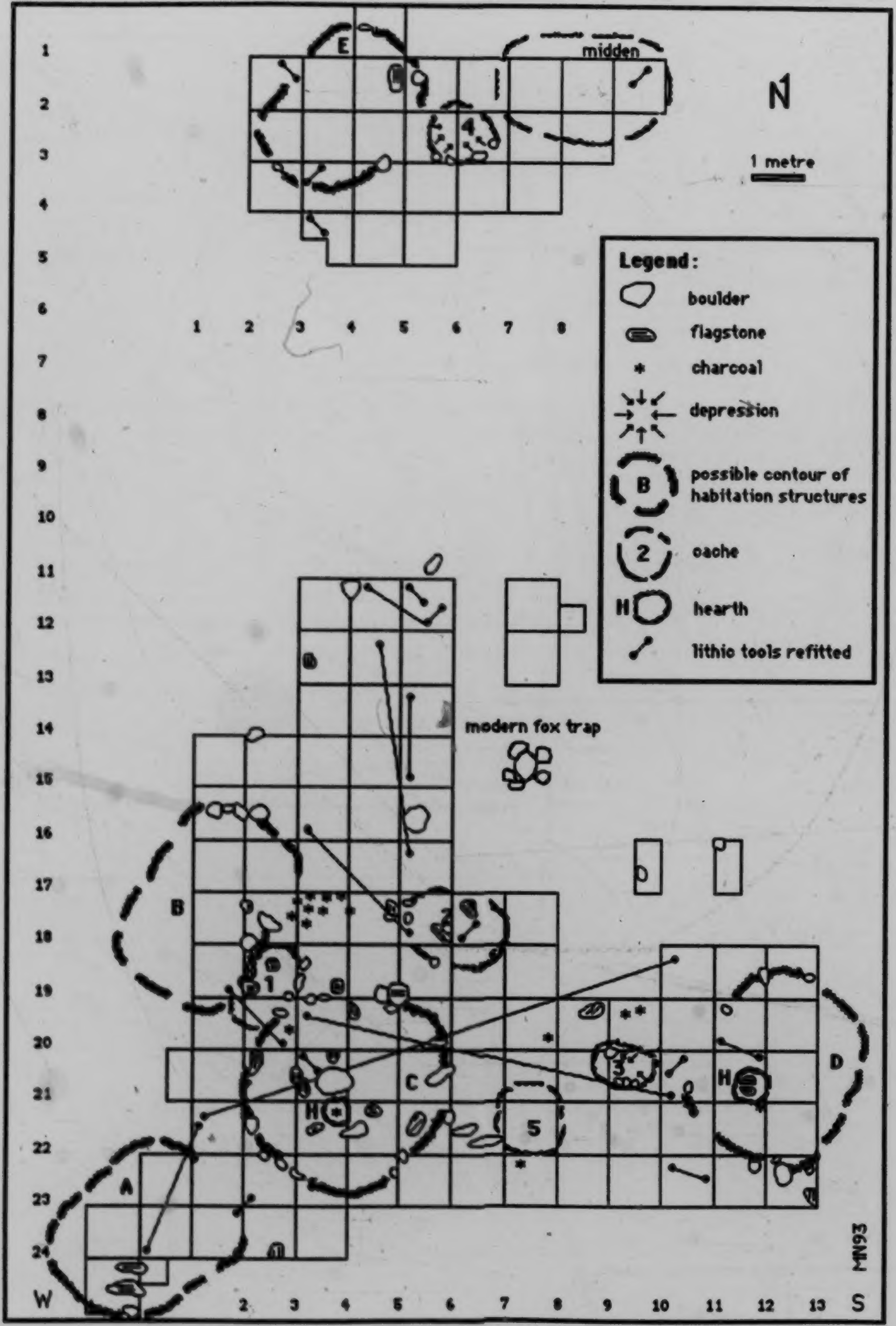
The Pita site was the most complex of all the sites excavated for this study. The large number of artifacts and faunal remains was even overwhelming. Two major questions needed to be resolved before interpreting possible activities that took place at the site. First was the issue of whether levels 1 and 2 represented two distinct occupations. Refitting analysis demonstrated that fragments from both levels came from the same objects (Figure 3.18). Furthermore, raw material and artifact distributions between both levels showed the same patterns (Nagy 1994a). The assumption that level 1 is a more recent occupation and level 2 an older one, was thus dismissed. Of course, this does not mean that all the cultural remains were the product of a single occupation. This occurs when the second question comes to mind: were all the structures used at the same time? Four lines of evidence were used to resolve this problem.

First, the style of habitation structures was considered. Structures C and D were identified as the remains of tents since they were surrounded by large boulders which could have served to hold down a skin tent. In the case of structure E, it was not completely clear if there was indeed a tent or if this was an open air area where different activities took place. To avoid any presumptions regarding its original function, structure E will be referred to as "area E". These structures/activity areas were interpreted as evidence of warm weather occupations. Structures A and B were identified as rectangular habitations surrounded by small sod and rock walls. Because of time and weather limitations, they were not completely excavated but their shape was suggested from the different vegetation growing at their locations; occupation during colder weather was assumed. If these assumptions are correct, and they will be tested in Chapter 4, at least two different patterns of occupation are presented at the Pita site: one indicated by structures C, D and E (during warm months), and the second grouping structures A and B (during cold months).

Second, refitted tool fragments were associated with the nearest habitation structure. This was not an easy task since artifacts were refitted within, between, and outside structures (see Figure 3.18). Refits within a structure or near its possible entrance were interpreted as belonging to the inhabitants of the structure. Refits between structures were interpreted as evidence of the contemporaneity of occupations between structures. The results of these associations suggest that structures B, C and D were occupied at the same time. It is also possible that each structure was occupied independently and that the presence of refits between structures was artificially created by repeated occupations of the site. It should be added here that although the soil was well drained during the excavation, it might have been muddy at times while it was occupied. Tool fragments might have been transported a long way while sticking to muddy footwear of the site inhabitants (Cliff Hickey, pers. comm. 1996).

Third, the style of artifacts was compared between structures to verify whether some had more similarities with Pre-Dorset or with Dorset material. All structures contained a mixture of styles belong to the Pre-Dorset, transitional and Dorset periods. This may indicate that all structures were occupied sometime during the transition period. However, it is impossible to distinguish occupations for each period based on typology.

Fourth, the distribution of exotic or rare lithic and organic materials was plotted to identify possible patterns within and between structures. The results were more conclusive than those from the refits and stylistic comparisons. With the exception of structure D, black quartzite and a rare type of glossy chert were present in all structures. In contrast, grey quartzite was associated only with structure D. This evidence would isolate structure D from all others. White quartzite was only found inside structure A, near C and in one


N
1 metre
midden
E
4
Legend:
boulder
flagstone
charcoal
depression
B
possible contour of habitation structures
2
cache
H
hearth
lithic tools refitted
modern fox trap
A
B
C
D
1
2
3
5
H
H
W
S
MN93
1
2
3
4
5
6
7
8
9
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13
14
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Figure 3.18 Pita site (KcFr-5): Lithic tools refitted between levels 1 and 2

instance inside area E, which in this case would isolate structure A from all others. Steatite fragments were excavated only in structures C and E. Finally, artifacts made of antler and caribou bone were found only within and around structure C and area E, as well as in and around the midden. In this last case, the discard pieces could have come from any structures. These distributions of lithic and organic material could indicate that structure C and area E were occupied at the same time.

When only lithic materials are considered, structures A and D seem to represent separate single occupations, while structure C and area E were very likely occupied at the same time. Even if all the structures were not inhabited simultaneously, the cumulative pattern in the distribution of exotic and rare materials indicates that the people who lived in structures A, B, C and area E had access to the same lithic sources. In the case of black quartzite, which contains iron, its source was very likely near Ungava Bay (see Plumet 1981).

Structure D differs from all the other structures by the presence of grey quartzite and the absence of the exotic materials associated with the other habitations. However, since the types of artifacts associated with structure D are similar to those found elsewhere at the site, this tent was likely occupied during the Pre-Dorset/Dorset transition. The tent was possibly put up by a single family with no neighbours camping very close to their quarters, or at least within the area that was excavated.

Raw materials and artifact distributions

At the Pita site, the 13,217 lithic artifacts recovered were mostly composed of debitage (92.1%, N=12,167) (Table 3.11). Among the 1050 lithic objects worked or utilized, burins (25%) and retouched/utilized flakes (19.5%) are the most common. They are followed by endblades (13.0%) and modified microblades (12.0%) (Table 3.12).

The most abundant raw material is chert (54.2%), followed by four types of quartz which amount to 36.4% of the raw materials (Table 3.10). Among the different quartzes, milky quartz (17.8%) and hyaline quartz (13.4%) are the most common. Other lithic materials are crystal quartz, coarse quartz, quartzite, siltstone, shale, slate, metabasalt, steatite, claystone, sandstone, nephrite, and one unidentified igneous rock. Objects made of organic materials were also found (Table 3.17). Of these, ivory (59.6%) is the most common, followed by bone (22.9%) and antler (17.5%) (Table 3.18).

Activity areas

A major attribute of the Pita site is its excellent view of Hudson Bay to look for marine mammals. When there is no fog, it is even possible to see Mansel Island, which is located some 60 km west of Ivujivik. Mr. Tivi Paningayak (then 74 years old) told me in 1990 that the site was used during his childhood as a lookout for whales. Palaeoeskimo people also took advantage of this strategic location as witnessed by the numerous artifacts and faunal material that they left at the Pita site. As mentioned earlier it is difficult to determine if some of the structures/activity areas were occupied contemporaneously or over a longer time span during the Pre-Dorset/Dorset transition. Spatial distribution of artifacts helped clarify the situation.

As it can be seen in Figure 3.19, there was a major concentration of debitage in the north extremity of structure C, which indicates that production or maintenance of tools was performed near the entrance rather than inside the tent. Alternatively, there is also the possibility that the work was done inside but the debitage was dumped near the entrance. Other concentrations of lithic debitage were found in the center and in the entrance of structure A, in the south-west corner of structure B, and between structures C and D, west of the cache pit 3. The presence of numerous lithic tools associated with structures A, C, D and area E must reflect a longer or more repeated occupation than in structure B (Figure 3.20). However, since structure B was only partially excavated, this explanation remains highly speculative.

When major classes of lithic tools are compared between structures/activity areas, two main patterns emerge (Figure 3.21). The first one is represented by structures A and B. It consists of a high percentage of burins followed by endblades/sideblades, then by modified microblades and bifaces/knives. The second pattern groups structures C and D. Both have high percentages of retouched/utilized flakes followed by burins, endblades/sideblades and bifaces/knives. The pattern found in area E is quite similar to the one associated with structures C and D with a major difference in the high percentage of burins. These are followed by retouched/utilized flakes, bifaces/knives and endblades/sideblades. The patterns observed would thus cluster in terms of activities, structures A and B and on the other hand, structures C, D and possibly area E.

One major distinction in artifact distribution between the two groups is the percentage of modified microblades, which is higher in structures A and B than in structures C, D and area E. To understand the reasons for these differences, more comparisons on the microblades were performed between structures/activity areas. Unmodified microblades were plotted with modified microblades for each structure. The logic behind this approach was that although some structures/activity areas may not have many modified microblades, it is still possible that microblades were produced in these areas as witnessed by unmodified ones that were part of the debitage. Comparisons demonstrated that although modified microblades were slightly more common at the Pita site as a whole, the reverse was true for most structures/activity areas (Figure 3.23). In effect, with the exception of structure D, all other structures/activity areas had higher numbers of unmodified microblades than modified ones, indicating that more microblades were produced than utilized inside the structures/activity areas (Table 3.14). Production of microblades within the structures/activity areas was also suggested by the fact that all structures/activity areas were associated with at least one microblade core.

In contrast, among all the microblades found outside the structures/activity areas (N=132), 42.4% were unmodified while 57.6% were modified, indicating that more activities linked to the utilization of microblades were undertaken outside the structure. This bring us back to the use of microblades. As was mentioned in Chapter 2, two different uses of microblades have been proposed: one for sewing (Maxwell 1985) and the other for butchering (Renouf 1994). Although both activities could take place outside, the presence of numerous modified microblades near all the cache pits and in the midden, would favour an interpretation that the primary use of microblades was to butcher parts of animals prior to caching them. This said, the few awls and needles recovered at the site were found only outside the structures/activity areas and were also in close proximity to modified microblades.

Since burins were the most numerous tools found at the site and in most of the structures/activity areas, burin percentages were also compared. The percentages were calculated for: spalled and polished burins, and burin-like tools (Table 3.15). The great majority of burins found at the site were spalled (81.4%), while 16.8% had been polished and only 1.8% were burin-like tools. Some of the spalled burins (Plate 21) seem to have been originally manufactured as concave sidescrapers, and possibly used as such, before serving as burins. Alternatively, spall scars may indicate that burins were retouched to use the tool as both a burin and a sidescraper.

Structure A was the only one associated with a burin-like tool, which could be interpreted as a later occupation during the Dorset period. However, the other artifacts found in structure A were stylistically similar to Pre-Dorset material culture (e.g., Plate 15-b) and the presence of a burin-like tool might indicate that such tools started to appear during the transition period. This was certainly the case of the polished burins, which, although few in numbers, were present in all the structures/activity areas (Figure 3.22).

The highest concentration of polished burins was found associated with area E, which is not too surprising since the area also contained the largest number of burins. The many burins found suggest that area E was possibly a workshop area where they were manufactured. Their high number in area E could also be explained by the inference that they were used to manufacture organic tools. In effect, on finding many burins at a Saqqaq site, Larsen and Melgaard (1958:67) commented that "when a people uses burins they are used to a great extent, and may later be found in considerable numbers." However, when the number of burin spalls are compared between structures/activity areas to estimate how many burins were actually used, only 18 are found in area E, while 23 were associated with structure A, 32 with C and 30 with D. Furthermore, only two pieces of ivory and one of antler were found in area E. This may suggest that burins were mostly produced at area E and less used in the manufacture of organic implements. It is also very likely that area E was used as a workshop area each time the site was occupied and this would explain the high number of burins found at that location. At the time of occupation the sea level would have been higher than presently and area E might have been a good location as a lookout. Furthermore and as was indicated earlier, area E might not have been a tent but and area where activities took place. Hunters could have been working on tool manufacture and maintenance while looking for animals. Nowadays, one of the best places as a lookout is on top of the rock exposure, west of the Pita site (Tivi Paningayak, pers. comm. 1990).

The manufacture of organic tools appears to have taken place mostly at and in front of structure C, while no evidence was found in structure A. At the site, the preferred material was ivory (59.6%) followed by bone (22.9%) and antler (17.5%) (Table 3.18). Ivory was also the most common material found in all the structures/activity areas (Figure 3.24). The presence of bone needles and awls indicate that sewing activities took place at the site. These tools were found outside the structures/activity areas and near and at the midden, which could indicate that the weather was warm enough to sew outside. Another possibility is that they were discarded outside the habitation structures as part of refuse. Other artifacts linked to skin preparation for sewing such as endscrapers and sidescrapers, were found both inside and outside structures/activity areas.

Endblades and sideblades were second to burins in the percentages of tools encountered in most structures/activity areas. To understand better their distribution in relation to specific hunting activities, the sideblades were distinguished from the endblades, which in turn were subdivided into four functional categories: indeterminate, arrow, harpoon and spear (Table 3.16). The "indeterminate" category means that the endblade could belong to any of the other categories, although more likely to those of arrows or spears. In effect, harpoon-blades were easily recognized by their triangular shape and their relative size. As for the organic components of the harpoon gear, it should be noted that only two harpoon fragments and two harpoon preforms were recovered at the site. This situation is intriguing since preservation conditions were excellent. The category "arrow" is of particular interest in relation to the transitional period since arrows supposedly disappeared from the hunting kit of the Dorset people. Their presence at the Pita site (e.g., Plates 14, 15 and 17) indicate that their complete loss was not initiated during the transitional period in this region.

Two patterns emerged from the distribution of lithic tools used for hunting per structure/activity area (Figure 3.25). The first pattern was associated with structures A and B. It showed a high percentage of indeterminate endblades, followed by arrowheads, sideblades and harpoonblades. In structure B, the large representation of indeterminate endblades is tentatively associated with the absence of spearheads and relatively low number of arrowheads, the two categories to which they probably belong. In effect, their broken condition did not allow them to be identified further than "indeterminate endblades." The second pattern was represented by structure C and area E, with a high percentage of arrowheads, followed by indeterminate endblades, sideblades and harpoonblades. Structure D has similar percentages to structure C and area E but no harpoonblades were found and it was the only structure with spearheads. The absence of arrowheads in structure D is likely correlated to the presence of spearheads. It is thus possible that animals such as seals were speared rather than harpooned by the hunters. This hypothesis will be developed in Chapter 4.

The two groups (structures A and B; structures C, D, and area E) found for the distribution of hunting tools fit with those obtained for the distribution of major lithic tool classes. Furthermore, these two groups correspond to those suggested from the type of habitations and from the proposed seasons of occupation discussed earlier in the text. It is thus suggested that two settlement patterns are found at the Pita site. One occurred during warm months when tent structures C, D and area E were used and tools were produced, animals were hunted and heavy butchering took place outside the structures where food was cached for future use. Evidence presented earlier regarding the distribution of lithic and organic artifacts suggests that structure C and area E were used at the same time, while structure D was an isolated occupation.

During colder months, people occupied structures A and B, which were smaller and sheltered by a small wall made of sod and rocks. Sod was probably more easy to quarry during the late summer or the fall. A fall/early winter occupation would thus be more likely than a winter/early spring one. Lithic material from these two structures suggests that during that season fewer activities were undertaken. In contrast to the pattern of utilization of the site during warmer weather, the butchering activities were undertaken mostly inside the structures. It would also seem that people lived more on food surplus accumulated during the warmer months. This last proposition will be tested in Chapter 4. Finally, it is difficult to know if structures A and B were used at the same time. Since only one of the two structure contained an exotic kind of quartzite, it is possible that they were occupied at different times. Only patterns of food sharing will help resolve this question and they will also be investigated in Chapter 4.

Table 3.10 Pita site (KcFr-5): Raw materials

Raw material	Number	%	Weight (g)	%
chert	7166	54.2	4233.8	30.7
quartz				
milky	2348	17.8	1698.2	12.3
hyaline	1774	13.4	2875.4	20.8
crystal	577	4.4	366.9	2.7
coarse	117	0.9	1828.0	13.3
quartz totals	*4816*	*36.4*	*6770.0*	*49.1*
quartzite	762	5.8	1455.6	10.6
siltstone	230	1.7	656.4	4.8
shale	219	1.7	485.3	3.5
slate	9	0.1	19.7	0.1
metabasalt	6	0.0	27.7	0.2
steatite	4	0.0	3.5	0.0
claystone	2	0.0	1.3	0.0
sandstone	1	0.0	2.8	0.0
nephrite	1	0.0	3.1	0.0
igneous rock	1	0.0	134.6	1.0
Totals	13217	100.0	13792.0	100.0

Table 3.11 Pita site (KcFr-5): Technological classes of lithic artifacts

Lithic artifacts	Number	%	Weight (g)	%
Debitage				
flakes and shatters	11697	88.5	5277.1	38.3
burin spalls	196	1.5	36.3	0.3
cores and core fragments	139	1.1	3868.5	28.0
unmodified microblades	118	0.9	40.4	0.3
microblade core fragments	13	0.1	83.1	0.6
burin-like tool spalls	3	0.0	0.5	0.0
tip-fluted spall	1	0.0	0.4	0.0
Modified flakes and blades				
retouched/utilized flakes	205	1.6	395.3	2.9
modified microblades	126	1.0	61.8	0.4
Bifaces				
endblades	137	1.0	145.5	1.1
knives	82	0.6	241.6	1.8
bifaces	38	0.3	334.3	2.4
sideblades	37	0.3	33.1	0.2
knife preforms	6	0.0	16.8	0.1
endblade preforms	4	0.0	8.2	0.1
choppers	1	0.0	300.1	2.2
Burins				
burins	262	2.0	434.0	3.1
burin-like tools	4	0.0	4.8	0.0
Gravers	18	0.1	13.4	0.1
Scrapers				
sidescrapers	80	0.6	163.1	1.2
endscrapers	24	0.2	74.6	0.5
scraper preform	1	0.0	3.0	0.0
Ground and pecked lithics				
polished fragments	7	0.1	9.6	0.1
hammers	7	0.1	1775.0	12.9
sharpeners	4	0.0	284.1	2.1
abraders	2	0.0	182.2	1.3
Miscellaneous				
drills	2	0.0	0.3	0.0
uniface fragments	2	0.0	4.0	0.0
carving preform	1	0.0	1.2	0.0
Totals	13217	100.0	13792.0	100.0

Debitage	Number	%	Weight (g)	%
Totals	12167	92.1	9306.3	67.5

Worked or utilized lithic objects	Number	%	Weight (g)	%
Totals	1050	7.9	4485.7	32.5

Table 3.12 Pita site (KcFr-5): Frequencies and % of debitage and worked/utilized lithic objects

Lithic artifacts	N	%
Debitage		
flakes and shatters	11697	96.1
burin spalls	196	1.6
core and core fragments	139	1.1
unmodified microblades	118	1.0
microblade core fragments	13	0.1
burin-like tool spalls	3	0.0
tip-fluted spalls	1	0.0
Totals	12167	100.0
Worked or utilized lithic objects		
burins	262	25.0
retouched/utilized flakes	205	19.5
endblades	137	13.0
modified microblades	126	12.0
knives	82	7.8
sidescrapers	80	7.6
bifaces	38	3.6
sideblades	37	3.5
endscrapers	24	2.3
gravers	18	1.7
hammers	7	0.7
polished fragments	7	0.7
knife preforms	6	0.6
burin-like tools	4	0.4
end blade preforms	4	0.4
sharpeners	4	0.4
abraders	2	0.2
drills	2	0.2
uniface fragments	2	0.2
carving preform	1	0.1
chopper	1	0.1
scraper preform	1	0.1
Totals	1050	100.0

Table 3.13 Pita site (KcFr-5): Major lithic tool classes per structure

Lithic tools	Habitation structures/activity areas											
	A		B		C		D		E		Whole site	
	N	%	N	%	N	%	N	%	N	%	N	%
bifaces, knives	10	10.9	4	14.8	27	17.2	9	14.8	14	14.1	120	12.0
burins (+ burin-like tools)	23	25.0	7	25.9	30	19.1	10	16.4	46	46.5	266	26.7
endblades, sideblades	20	21.7	7	25.9	29	18.5	8	13.1	11	11.1	177	17.7
modified microblades	15	16.3	4	14.8	20	12.7	7	11.5	4	4.0	126	12.6
retouched/utilized flakes	13	14.1	2	7.4	33	21.0	20	32.8	16	16.2	205	20.5
scrapers	11	12.0	3	11.1	18	11.5	7	11.5	8	8.1	104	10.4
Totals	92	100.0	27	100.0	157	100.0	61	100.0	99	100.0	998	100.0

Table 3.14 Pita site (KcFr-5): Microblades per structure

Microblades	Habitation structures/activity areas											
	A		B		C		D		E		Whole site	
	N	%	N	%	N	%	N	%	N	%	N	%
unmodified microblades	16	51.6	7	63.6	27	57.4	5	41.7	7	63.6	118	48.4
modified microblades	15	48.4	4	36.4	20	42.6	7	58.3	4	36.4	126	51.6
Totals	31	100.0	11	100.0	47	100.0	12	100.0	11	100.0	244	100.0

Table 3.15 Pita site (KcFr-5): Types of burins per structure

Burins	Habitation structures/activity areas											
	A		B		C		D		E		Whole site	
	N	%	N	%	N	%	N	%	N	%	N	%
spalled burins	21	91.3	6	85.7	28	93.3	9	90.0	40	87.0	184	81.4
polished burins	1	4.3	1	14.3	2	6.7	1	10.0	6	13.0	38	16.8
burin-like tools	1	4.3	0	0.0	0	0.0	0	0.0	0	0.0	4	1.8
Totals	23	100.0	7	100.0	30	100.0	10	100.0	46	100.0	226	100.0

Table 3.16 Pita site (KcFr-5): Lithic tools for hunting per structure

Lithic tools for hunting	Habitation structures/activity areas											
	A		B		C		D		E		Whole site	
	N	%	N	%	N	%	N	%	N	%	N	%
endblade (indet.)	8	40.0	4	57.1	9	30.0	2	25.0	3	27.3	72	41.4
endblade (arrow)	6	30.0	1	14.3	9	30.0	3	37.5	4	36.4	42	24.1
endblade (harpoon)	1	5.0	1	14.3	5	16.7	0	0.0	2	18.2	17	9.8
endblade (spear)	0	0.0	0	0.0	0	0.0	1	12.5	0	0.0	6	3.4
sideblade	5	25.0	1	14.3	7	23.3	2	25.0	2	18.2	37	21.3
Totals	20	100.0	7	100.0	30	100.0	8	100.0	11	100.0	174	100.0

Table 3.17 Pita site (KcFr-5): Organic artifacts

Technological classes	N	%
Debitage		
flakes	62	37.3
worked fragments	27	16.3
blanks	16	9.64
cores	6	3.61
shavings	2	1.2
tine fragment	1	0.6
Subtotals	114	68.7
Preforms		
preforms unidentified	11	6.63
neddle preforms	12	7.23
harpoon preforms	2	1.2
awl preform	1	0.6
handle preform	1	0.6
Subtotals	27	16.3
Finished implements		
tool fragments	8	4.82
awls	2	1.2
handles	2	1.2
needles	2	1.2
plugs	2	1.2
harpoons	2	1.2
harpoon shafts	2	1.2
carving	1	0.6
circular/flat object	1	0.6
decorated fragment	1	0.6
mattock blade	1	0.6
scraper	1	0.6
Subtotals	25	15.1
Totals	166	100

Table 3.18 Pita site (KcFr-5): Organic materials per structure

Organic materials	Habitation structures/activity areas											
	A		B		C		D		E		Whole site	
	N	%	N	%	N	%	N	%	N	%	N	%
antler	0	0.0	2	40.0	8	40.0	0	0.0	1	50.0	29	17.5
bone	0	0.0	1	20.0	0	0.0	0	0.0	0	0.0	38	22.9
ivory	0	0.0	2	40.0	12	60.0	3	100.0	1	50.0	99	59.6
Totals	0	0.0	5	100.0	20	100.0	3	100.0	2	100.0	166	100.0

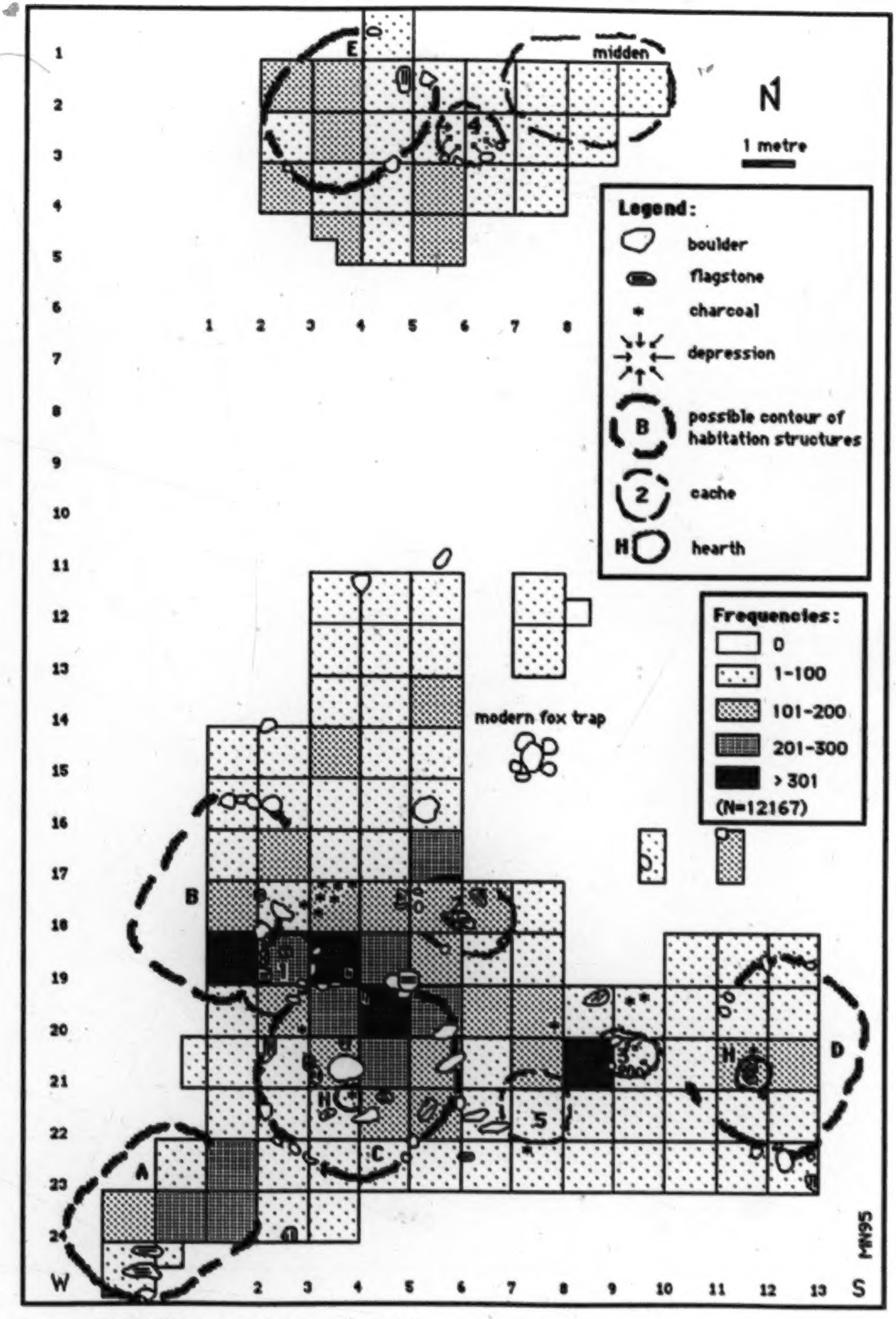

N
1 metre
Legend:
boulder
flagstone
charcoal
depression
B
possible contour of habitation structures
2
cache
H
hearth
Frequencies:
0
1-100
101-200
201-300
> 301
(N=12167)
midden
modern fox trap
E
4
B
A
C
H
5
H
D
W
S
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
1 2 3 4 5 6 7 8
2 3 4 5 6 7 8 9 10 11 12 13
MN95

Figure 3.19 Pita site (KcFr-5): Debitage distribution

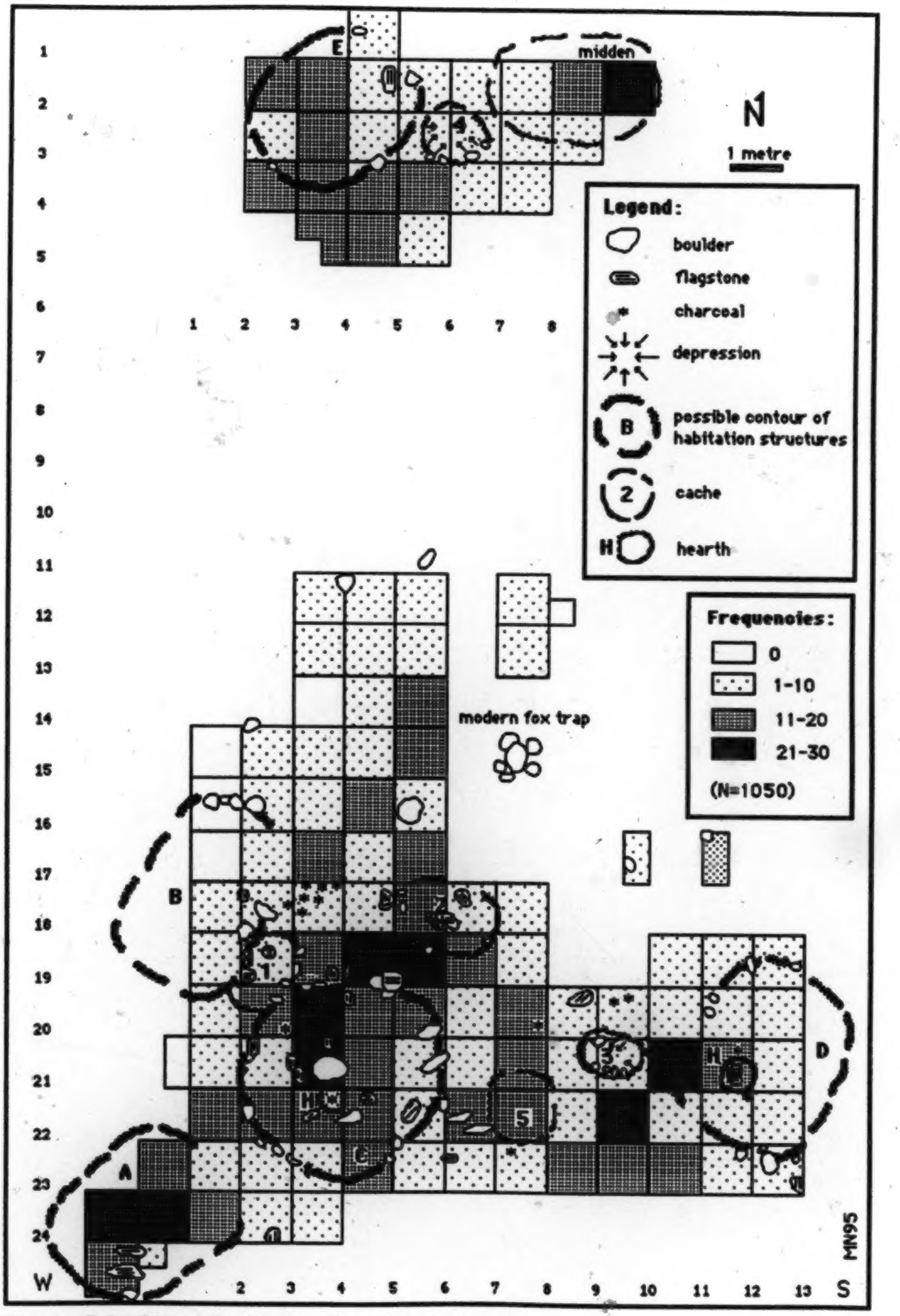

N
1 metre
midden
E
4
Legend:
boulder
flagstone
charcoal
depression
B
possible contour of habitation structures
2
cache
H
hearth
modern fox trap
Frequencies:
0
1-10
11-20
21-30
(N=1050)
B
1
A
H
C
5
3
H
D
MN95
W
S
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Figure 3.20 Pita site (KcFr-5): Lithic tools distribution

Figure 3.21 Pita site (KcFr-5): Major lithic tool classes per structure/activity area

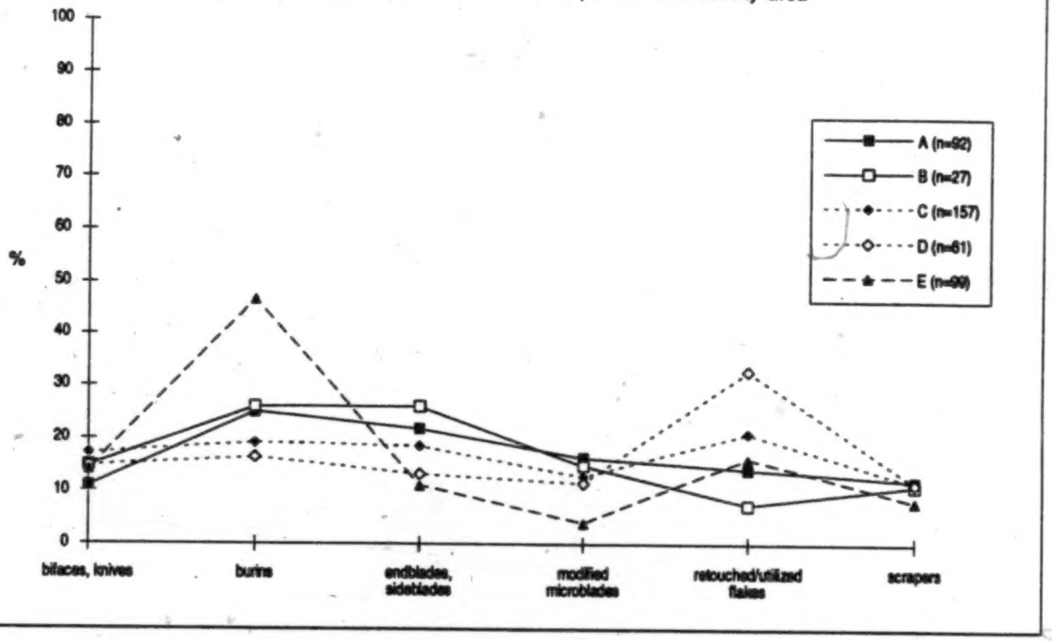


Figure 3.22 Pita site (KcFr-5): Microblades per structure/activity area

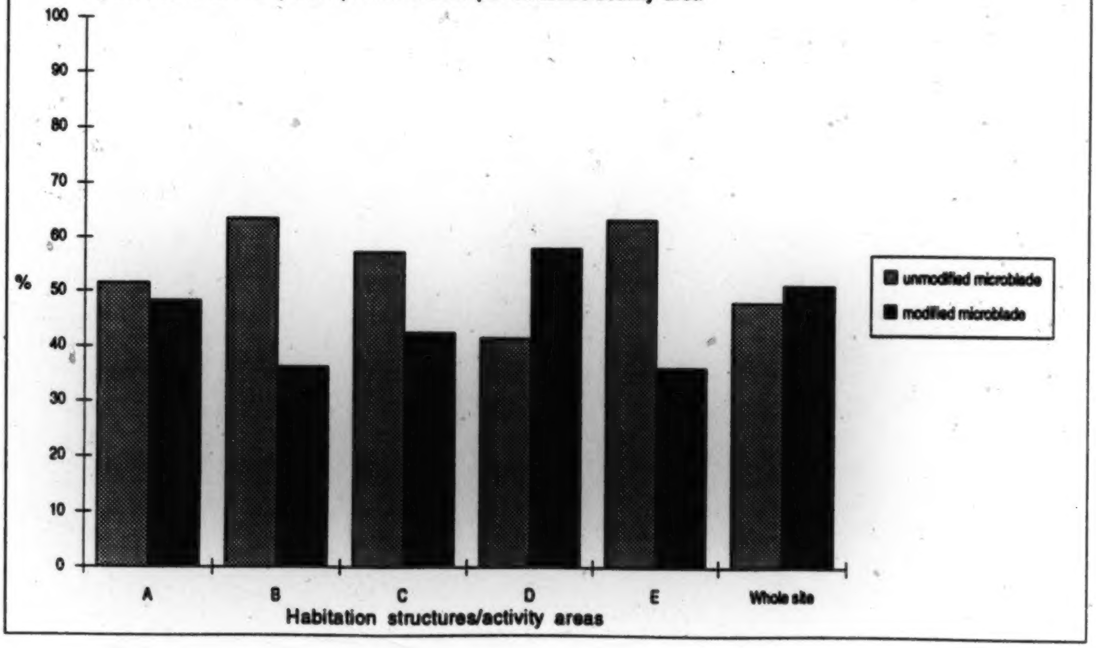


Figure 3.23 Types of burins per structure/activity area

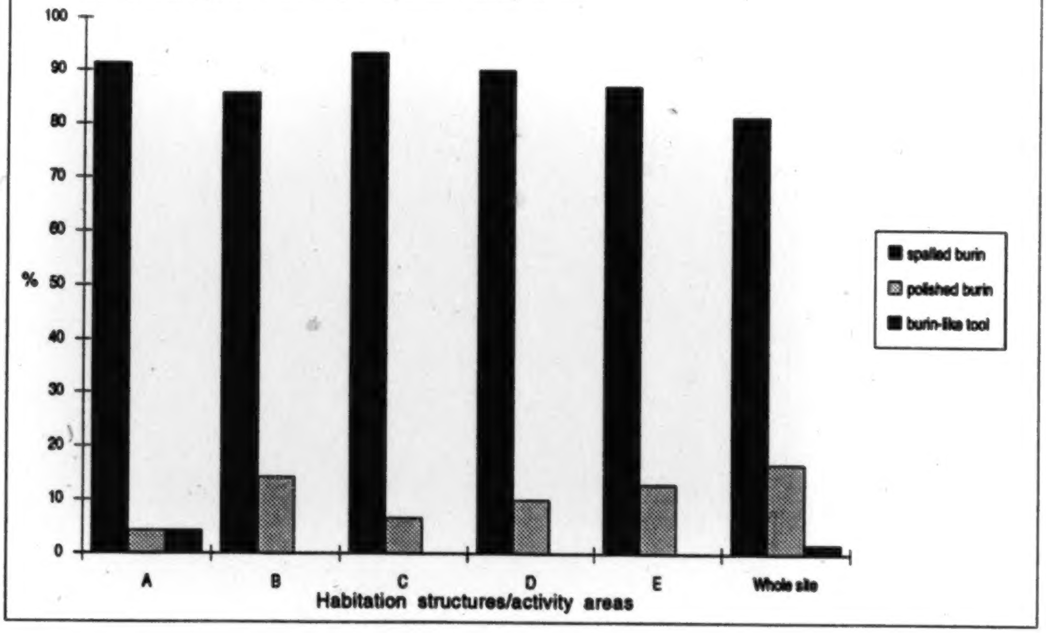


Figure 3.24 Pita site (KcFr-5): Organic materials per structure/activity area

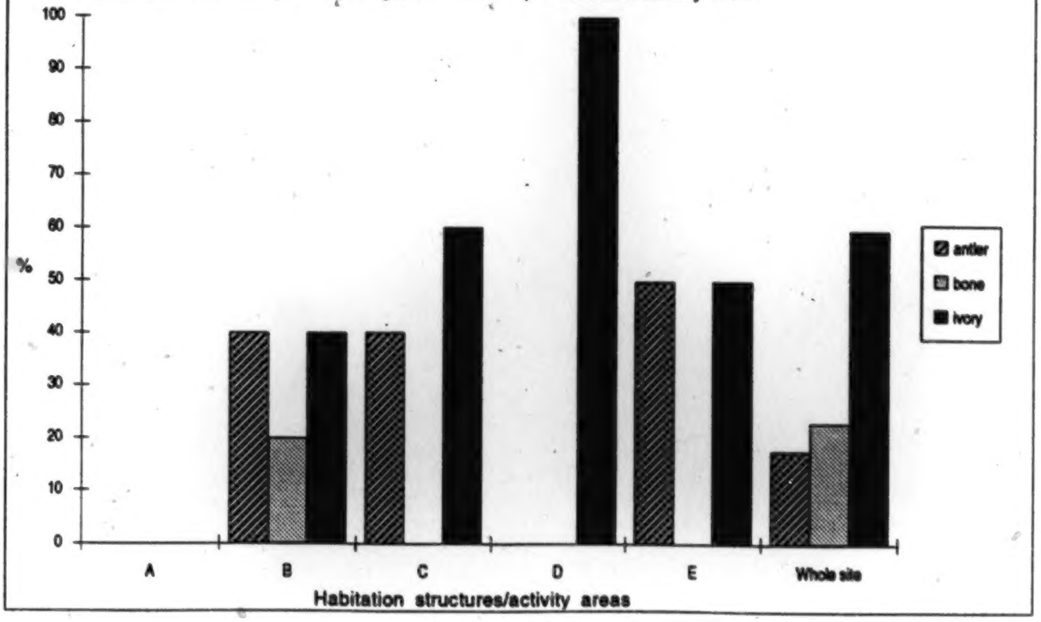
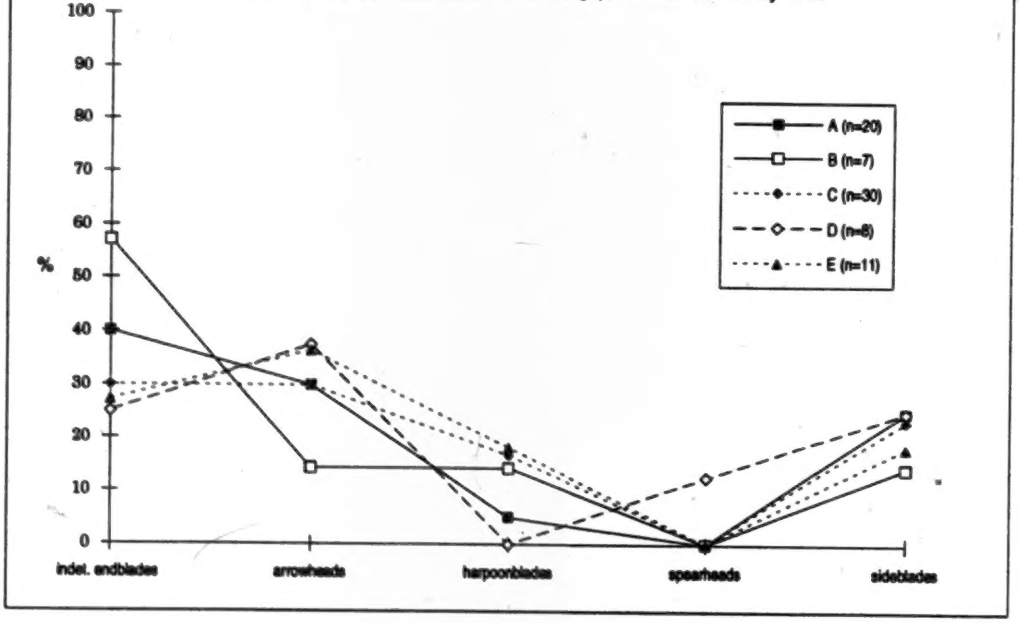


Figure 3.25 Pita site (KcFr-5): Lithic tools for hunting per structure/activity area



Ohituk (KcFr-3A)

Description

The Ohituk site is located about 800 metres northwest of the village of Ivujivik and 200 metres north of the Pita site, in a small valley (62°25'24"N, 77°55'28"W). The site is composed of three areas designated A, B and C that cover about 635 square metres (Figure 3.26). The Ohituk site was excavated in 1988 by the Avataq Cultural Institute for the Ministère des Transports du Québec under the direction of the author (Avataq 1989, Nagy 1994b). This project was a salvage excavation concentrating on area A, the most endangered by active erosion. Areas B and C were also tested. Area C is located 16 metres above sea level and was originally identified by Taylor (1960) as belonging to the Early Dorset period. However, stylistic attributes of a few lithic artifacts recovered during the 1988 testing of area C would link it to Middle to Late Dorset rather than Early Dorset (Nagy 1994b). Areas A and B are at 23 metres above sea level and 100 metres from the present shoreline. They cover respectively an area of 400 square metres and 160 square metres.

In area A, the focus of this section, no habitation structure was identified by Aménatech in 1984. However, as it will be argued in detail later in this chapter, the spatial distribution of artifacts strongly suggest that there was a tent in the centre of the site (Figure 3.27). There are two ways to estimate the shape and dimensions of that habitation structure. One possibility corresponds to a rectangular-shaped tent, measuring 5 x 3 metres. In the west part of the tent, a hearth was indicated by charcoal fragments associated with flagstones; the eastern portion may have been a sleeping area. The other possibility is that a smaller tent measuring 3 x 2 metres was located only within the eastern space and which contained almost no artifacts. In this case, the hearth feature would have been located outside the tent, on its west site. The tent would have been used only for sleeping.

The stratigraphy of area A is composed of two layers. The upper layer is 2 to 5 cm thick, and is made of moss, lichen and grass. It rests on a humus layer of 5 to 20 cm that has a few pockets of sand, gravel and shells. Level 2 lies below and is made of a darker humus that also contains sand; it varies from 4 to 20 cm in depth. These two levels were occasionally separated by an eolian sand layer 5 to 10 cm thick. The composition of level 2 is regular but an accumulation of sand, gravel and large rocks was noted southeast of N9E8. Other similar intrusions in level 2 were located in the southeast part of the site.

Levels 1 and 2 were first thought to belong to two distinct cultural occupations (Avataq 1989: 20). During the analysis, fragments of lithic tools were refitted between the two levels (Figure 3.28). For this reason, and because there is continuity in the concentration of debitage and raw materials between the two levels, it now seems that they do not represent two distinct cultural occupations (Nagy 1994b). Most of the refitting was around the

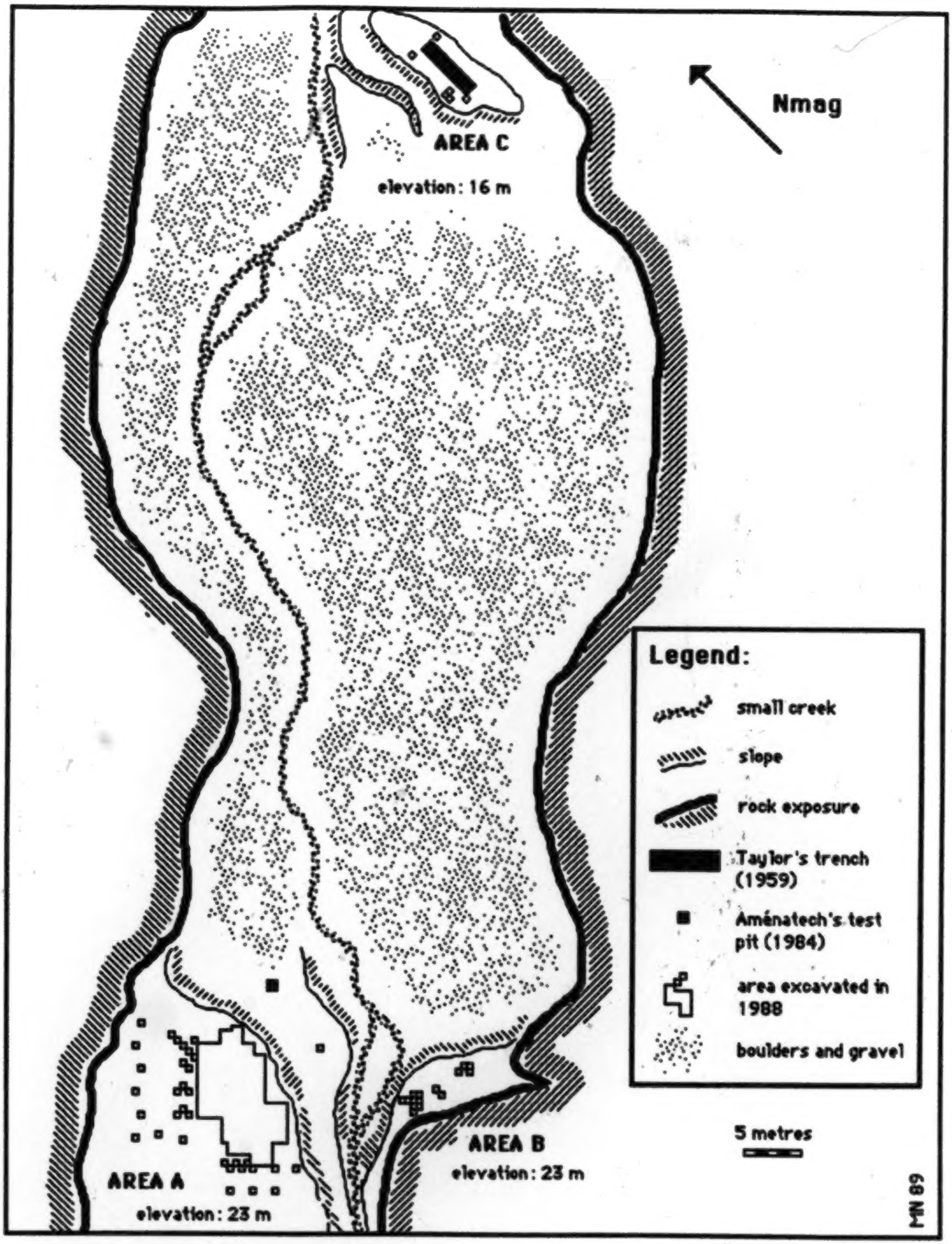

Nmag
AREA C
elevation: 16 m
AREA A
elevation: 23 m
AREA B
elevation: 23 m
Legend:
small creek
slope
rock exposure
Taylor's trench (1959)
Aménatech's test pit (1984)
area excavated in 1988
boulders and gravel
5 metres
MN 89

Figure 3.26 Ohituk site (KcFr-3)

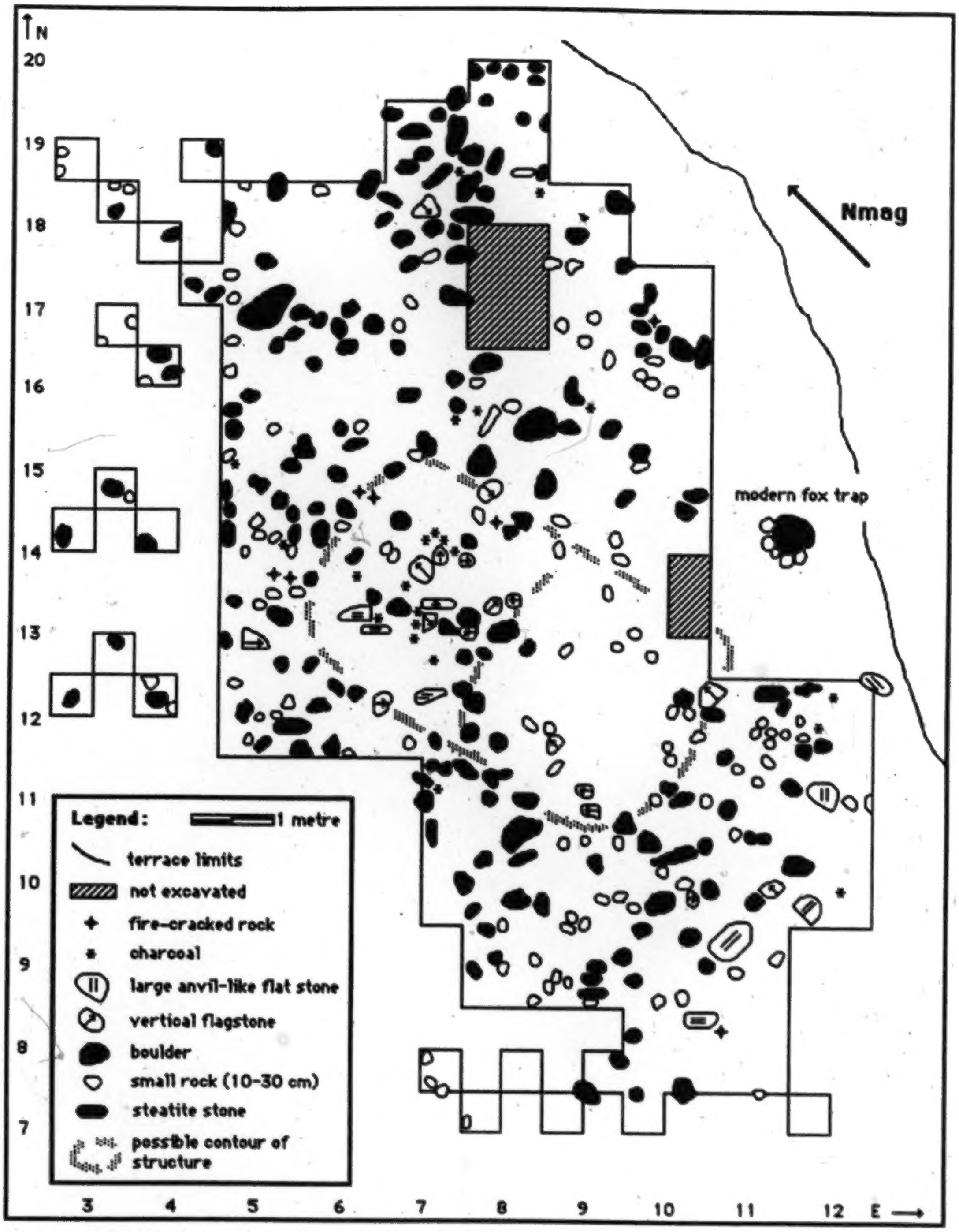

N
Nmag
modern fox trap
20
19
18
17
16
15
14
13
12
11
10
9
8
7
3
4
5
6
7
8
9
10
11
12
E
Legend:
1 metre
terrace limits
not excavated
fire-cracked rock
charcoal
large anvil-like flat stone
vertical flagstone
boulder
small rock (10-30 cm)
steatite stone
possible contour of structure

Figure 3.27 Ohituk site, area A (KcFr-3A): Excavated units

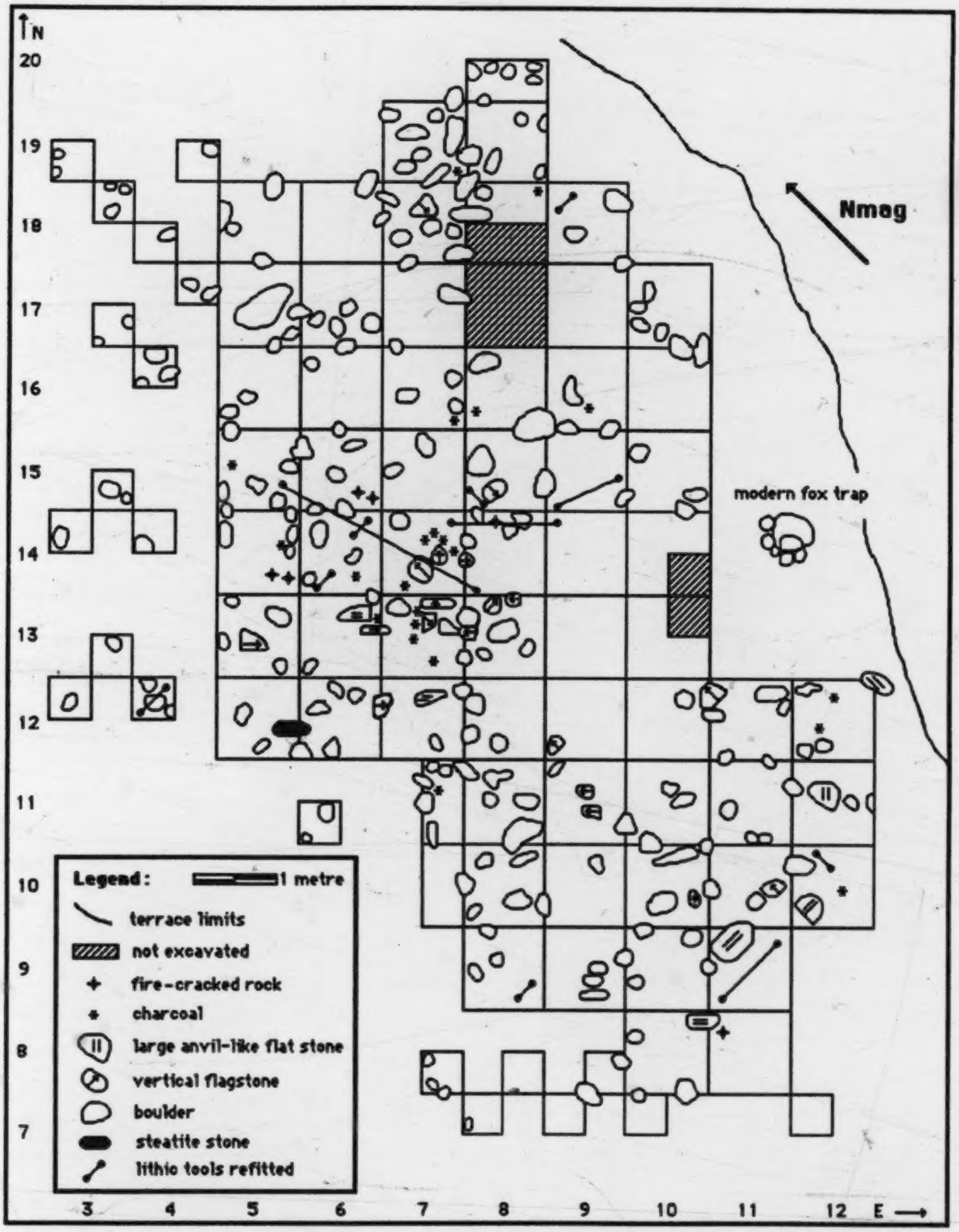

N
Nmag
modern fox trap
20
19
18
17
16
15
14
13
12
11
10
9
8
7
3
4
5
6
7
8
9
10
11
12
E
Legend:
1 metre
terrace limits
not excavated
fire-cracked rock
charcoal
large anvil-like flat stone
vertical flagstone
boulder
steatite stone
lithic tools refitted

Figure 3.28 Ohituk site (KcFr-3A): Lithic tools refitted between levels 1 and 2

hearth, a fact that can be explained because the area was warm and thus more trampling occurred in this location (Cliff Hickey, pers. comm. 1996).

Chronology

The artifacts of KcFr-3A associate the site with an Early Dorset occupation (Plates 29-33). This is particularly the case for the harpoon head found in level 1 of unit N10E8 (Plate 33-e). This harpoon is similar to those found by Taylor (1968: 118; figures 22-e and g) at the Tyara site located near Salluit (Figure 3.1). Radiocarbon dates for older levels of the Tyara site are 2670±130 B.P. (GSC-701) and 2630±130 B.P. (GSC-703) (Taylor 1968:107), but since they were obtained on sea mammal bones, the reservoir effect (see Arundale 1981) would likely cause results that are skewed toward dates that are too old. Early Dorset occupations are generally dated between 550±50 to 300±50 B.C. (Maxwell 1985:168).

It is difficult to determine if all the artifacts found at KcFr-3A were deposited during a single occupation. Ideally, many radiocarbon dates could possibly help resolve the issue. However, because of the high costs associated with radiocarbon dating, only two dates were obtained. The first sample was from three fragments of willow charcoal found in level 1 of unit N13E7 and thus very likely associated with the remains of a hearth feature that was originally surrounded by flagstones. It gave an uncalibrated date of 1450±130 B.P. (Beta-62290). Once calibrated with the intercept method at 1 sigma (Stuiver and Becker 1986), it dates between 1580 and 1320 years calibrated B.P. (or 435 and 675 years calibrated A.D.). Such a recent date would place the occupation of KcFr-3A well within the Dorset period and not at its beginning as suggested by the style of the artifacts.

However, a second sample from caribou bones excavated in level 2 of units N10E9 and N10E10 gave an uncalibrated date of 2520±80 B.P. (AECV-1795C). Once calibrated using the intercept method at 1 sigma (Stuiver and Becker 1986), it dates between 2747 to 2466 years calibrated B.P. (or 798 to 517 years calibrated B.C.). This date would place the occupation of KcFr-3A during the Pre-Dorset/Dorset transition or at the very Early Dorset period as originally suggested by the style of the artifacts.

There are many ways to interpret these two dates. First, one could reject the more recent date since it does not correspond to the cultural identification based on the typology of artifacts. Secondly, the two dates could be accepted as corresponding to two different levels of occupation since the dating of level 1 is younger than the dating of level 2. Nevertheless, and as mentioned earlier, the high concentration of debitage in both levels of the same units and the refitting of tools fragments from both levels suggest that the latter are not the results of two different occupations. By rejecting the hypothesis of the two distinct levels of occupation, the possibility remains that the site was repeatedly occupied. The caribou bones would belong to an older occupation during which the high concentrations of debitage were accumulated and later dispersed into levels 1 and 2. The date of the charcoal sample and the hearth feature with which is was associated would belong to a more recent occupation, rather brief and without many artifacts from the later stages of the Dorset period.

A variation of this explanation is that the same hearth was used during different time periods, one of the last ones being of limited duration, thus leaving behind few cultural remains from the Dorset period. This reasoning seems to be most plausible. In effect, I have seen Inuit use and often *reuse* small flagstones in the construction of small hearths to boil water. The most recent date would thus be associated with one of the last occupations of the site. Furthermore, to avoid the risk of mixing charcoal fragments from different events, only three fragments from one unit were selected. In consequence, dates from other charcoal samples could be different and possibly similar in age with the caribou bones.

Nature of occupations

Two issues needed to be clarified before working on the types of activities that took place at KcFr-3A. First, there was the question of whether levels 1 and 2 represented two distinct occupations. As mentioned in earlier, refitting of artifacts between levels 1 and 2, and continuity in the distribution of lithic materials indicate that it is not possible to distinguish different occupation levels. Second, there was the difficulty of identifying any structural remains during the excavation because of the omnipresent distribution of boulders. Incidentally, if the site was occupied when there was still snow on the ground, the boulders would have been covered and thus, not have been as conspicuous to the occupants.

By looking at the distribution of debitage and tools, it is possible to discern that activities took place in two major areas of KcFr-3A: in the centre and in the southeast. The first concentration of lithic artifacts is located northeast of a hearth located in unit N13E7 (Figure 3.29). These remains might have been associated with a tent structure surrounding the hearth. Since the abundance of the lithic debitage would have been at least awkward and even dangerous if located inside a habitation structure, it is more likely that part of the debitage was located outside a tent, possibly near its entrance. The area on the southeast of the hearth did not contain much rocks or artifacts and might have been used as the sleeping area of the tent. The tent would thus have been rectangular in shape, measuring 5 x 3 metres (Figure 3.27). It is also possible that a smaller tent measuring 3 x 2 metres was located only within the space that had few artifacts. In this case, the hearth feature would have been located outside the tent, on its west site. The tent would have been used only for sleeping purposes.

In the southeast section of KcFr-3A, where the second concentration of debitage and lithic tools was recovered, four large flat rocks were possibly used as small tables or as anvils (Figure 3.29). Although it is not possible to distinguish a habitation structure in this area, it is clear that many activities were undertaken there. The amount of archaeological material found at KcFr-3A, and the possible presence of only one tent in that area, suggest that the major occupation of the site was linked to one family camping there for a longer period than were the Pre-Dorset sites, that is for a few weeks or even a few months.

Raw material and artifact distributions

A total of 5529 lithic artifacts were excavated at area A of the Ohituk site. Debitage represented 96.0% of the assemblage and worked or utilized objects 3.9% (Table 3.20). Among the 220 artifacts from the latter category, modified microblades (39.5%), knives (10%) and endblades (10%) were the most numerous (Table 3.21).

The most abundant raw material is chert (69.7%), followed by four types of quartz (26.9%) (Table 3.19). Of those, milky quartz (15.5%) and hyaline quartz (7.9%) are the most common. Other raw materials are crystal quartz, coarse quartz, siltstone, quartzite, shale, nephrite, rhyolite, slate, sandstone and metabasalt. Despite the good preservation of the faunal remains, only 15 organic artifacts were found at KcFr-3A (Table 3.26). The most abundant organic material is antler (43.5%), then ivory (30.4%) and bone (26.1%) (Table 3.27).

Activity areas

As mentioned earlier, two major concentrations of lithic materials were found in KcFr-3A. One was associated with a possible tent structure at the centre of the site and another in the southeast area. It was not clear if the two areas were occupied contemporaneously but the spatial distribution of lithic materials suggest that they were. In effect, exotic raw materials are distributed all over KcFr-3A (Nagy 1994b). The exceptions were concentrations of blue quartzite in the southeast area and of pink banded chert and grey quartzite in the centre of the site. These quartzite concentrations were associated with flintknapping activities, but since blue quartzite was also found in the centre of the site and grey quartzite was also excavated in the southeast, these activities were probably contemporaneous. In the case of the pink banded chert, these were all modified microblades but there was no evidence that they were produced at the site since no cores or unmodified microblades made from the same type of chert were recovered.

When the two areas of activities are compared in terms of their percentages of major lithic tools, the centre area follows the same pattern described earlier for the whole of KcFr-3A: an abundance of modified microblades followed by endblades/sideblades and by bifaces/ knives (Figure 3.31). The southeast area had numerous bifaces/knives followed by modified microblades. If Renouf's (1994) functional identification of microblades is correct then the modified microblades and the bifaces/knives were likely associated with butchering activities carried on outside the tent. This interpretation is also suggested by their close location to flat boulders that were possibly used as tables or anvils for butchering animals. In the identification of the function of the southeast area, these types of activities will be tested during the analysis of the faunal material in Chapter 4.

Since more than half of the debitage came from the centre of KcFr-3A, it could indicate that the occupants used this space to make stone tools. Another possibility is that the debitage was dumped there after having been produced nearby. Comparison of percentages of lithic tools used for hunting show that the centre area was associated with a higher percentage of sideblades followed by equal percentages of unidentified endblades, arrowheads and harpoonblades (Figure 3.35). In the southeast section, sideblades were followed by harpoonblades and then arrowheads. It should be noted that these results are somewhat obscured by the numerous endblade fragments that could not be functionally identified.

The centre of KcFr-3A was also used to produce microblades as witnessed by the presence of microblade cores and numerous microblades. Half of the latter had traces of usewear or retouch (Table 3.23, Figure 3.32). Fewer microblades were found in the southeast area but the absence of cores suggest that none were actually produced there. Burins and burin-like tools were found in both areas of the site. Burin-like tools were the most numerous (Table 3.24). Polished burins were recovered only in the southeast area (Figure 3.33). The presence of spalls from burin-like tools indicate that the spalling technique was still used to resharp the edges of burin-like tools. Artifacts made of organic materials were found near burins, burin-like tools and burin spalls. This association strongly suggests that burins were used in their manufacture.

A needle fragment in bone and three awl fragments indicate that sewing took place at KcFr-3A. The needle fragment and a harpoon fragment were found in the middle of the site, near the hearth that was possibly inside a tent. The awl fragments and the other harpoon fragments were found in the northern, southern and central parts of KcFr-3A. A harpoon head similar to those usually found at early Dorset sites (Plate 33-e) was also found southeast of the site. As for the possible activities associated with the harpoon fragments, it is difficult to tell if they were in the final stage of manufacture when they were

Table 3.19 Ohituk site, area A (KcFr-3A): Raw materials

Raw material	Number	%	Weight (g)	%
chert	3856	69.74	738.2	35.00
quartz				
milky	859	15.54	269.3	12.77
hyaline	438	7.92	332.1	15.75
crystal	187	3.38	95.1	4.51
coarse	5	0.09	28.6	1.36
quartz totals	*1489*	*26.93*	*725*	*34.38*
siltstone	77	1.39	220	10.43
quartzite	63	1.14	103	4.88
shale	15	0.27	20.2	0.96
nephrite	12	0.22	13.3	0.63
rhyolite	11	0.20	34.8	1.65
slate	4	0.07	6.2	0.29
sandstone	1	0.02	3.9	0.18
metabasalt	1	0.02	244.6	11.60
Totals	5529	100.00	2109	100.00

Table 3.20 Ohituk site, area A (KcFr-3A): Categories of lithic artifacts

Lithic artifacts	Number	%	Weight (g)	%
Debitage				
flakes and shatters	5178	93.65	1196.2	56.73
unmodified microblades	85	1.54	18.5	0.88
cores and core fragments	22	0.40	364.9	17.31
burin-like tool spalls	10	0.18	1.4	0.07
microblade cores	7	0.13	41.1	1.95
burin spalls	6	0.11	1.1	0.05
tip-fluted spall	1	0.02	0.2	0.01
Modified flakes and blades				
modified microblades	87	1.57	31.7	1.50
retouched/utilized flakes	19	0.34	30.6	1.45
Bifaces				
endblades	22	0.40	18.1	0.86
knives	22	0.40	33.8	1.60
bifaces	15	0.27	33.7	1.60
sideblades	11	0.20	5.8	0.28
knife preforms	3	0.05	10.6	0.50
biface preforms	2	0.04	10.7	0.51
chopper/scraper	1	0.02	244.6	11.60
endblade preform	1	0.02	0.5	0.02
Burins				
burins	6	0.11	7.1	0.34
burin-like tools	8	0.14	12.9	0.61
Scrapers				
sidescrapers	5	0.09	8.2	0.39
endscrapers	3	0.05	11.1	0.53
endscraper preform	1	0.02	19.1	0.91
sideblade preform	1	0.02	1.8	0.09
Ground and Pecked Lithics				
polished fragments	3	0.05	1.8	0.09
Miscellaneous				
unid. tool fragments	7	0.13	1.5	0.07
uniface fragments	3	0.05	1.4	0.07
Totals	5529	100.00	2108.4	100.00

Debitage	Number	%	Weight (g)	%
Totals	5309	96.02	1623.4	77.00

Worked or utilized lithic objetcs	Number	%	Weight (g)	%
Totals	220	3.98	485	23.00

Table 3.21 Ohituk site, area A (KcFr-3A):
Frequencies and % of debitage and worked/utilized lithic objects

Lithic artifacts	N	%
Debitage		
flakes and shatters	5178	97.5
unmodified microblades	85	1.6
core and core fragments	22	0.4
burin-like tool spalls	10	0.2
microblade cores	7	0.1
burin spalls	6	0.1
tip-fluted spall	1	0.0
Totals	5309	100.0
Worked or utilized lithic objects		
modified microblades	87	39.5
knives	22	10.0
endblades	22	10.0
retouched/utilized flakes	19	8.6
bifaces	15	6.8
sideblades	11	5.0
tool fragments	7	3.2
burins	6	2.7
burin-like tools	8	3.6
sidescrapers	5	2.3
endscrapers	3	1.4
knife preforms	3	1.4
polished fragments	3	1.4
uniface fragments	3	1.4
biface preforms	2	0.9
chopper/scraper	1	0.5
endblade preform	1	0.5
endscraper preform	1	0.5
sidescraper preform	1	0.5
Totals	220	100.0

Table 3.22 Ohituk site, area A (KcFr-3A):
Major lithic tool classes per activity area

Lithic tools	Activity areas					
	Centre		Southeast		Whole site	
	N	%	N	%	N	%
bifaces, knives	8	8.2	32	38.1	37	18.7
burins (+ burin-like tools)	6	6.2	7	8.3	14	7.1
endblades, sideblades	20	20.6	14	16.7	33	16.7
modified microblades	54	55.7	18	21.4	87	43.9
retouched/utilized flakes	5	5.2	7	8.3	19	9.6
scrapers	4	4.1	6	7.1	8	4.0
Totals	97	100.0	84	100.0	198	100.0

Table 3.23 Ohituk site, area A (KcFr-3A): Microblades per activity area

Mircoblades	Activity areas					
	Centre		Southeast		Whole site	
	N	%	N	%	N	%
unmodified microblades	48	47.1	21	53.8	85	49.4
modified microblades	54	52.9	18	46.2	87	50.6
Totals	102	100.0	39	100.0	172	100.0

Table 3.24 Ohituk site, area A (KcFr-3A): Types of burins per activity area

Burins	Activity areas					
	Centre		Southeast		Whole site	
	N	%	N	%	N	%
spalled burins	1	20.0	1	14.3	2	14.3
polished burins	0	0.0	2	28.6	4	28.6
burin-like tools	4	80.0	4	57.1	8	57.1
Totals	5	100.0	7	100.0	14	100.0

Table 3.25 Ohituk site, area A (KcFr-3A): Lithic tools for hunting per activity area

Lithic tools for hunting	Activity areas					
	Centre		Southeast		Whole site	
	N	%	N	%	N	%
endblade (indet.)	4	30.8	1	7.1	7	21.2
endblade (arrow)	4	30.8	2	14.3	7	21.2
endblade (harpoon)	2	15.4	3	21.4	7	21.2
endblade (spear)	1	7.7	0	0.0	1	3.0
sideblade	2	15.4	8	57.1	11	33.3
Totals	13	100.0	14	100.0	33	100.0

Table 3.26 Ohituk site, area A (KcFr-3A): Organic artifacts

Artifact categories	N	%
Debitage		
worked fragments	6	26.1
blanks	2	8.7
flakes	2	8.7
Subtotals	10	43.5
Finished implements		
harpoons	5	21.7
awls	4	17.4
flaking punch	1	4.3
knife (for flensing)	1	4.3
spatula	1	4.3
tool fragment	1	4.3
Subtotals	13	56.5
Totals	23	100.0

Table 3.27 Ohituk site, area A (KcFr-3A):
Organic materials per activity area

Organic materials	Activity areas					
	Centre		Southeast		Whole site	
	N	%	N	%	N	%
antler	2	16.7	7	63.6	10	43.5
bone	4	33.3	2	18.2	6	26.1
ivory	6	50.0	2	18.2	7	30.4
Totals	12	100.0	11	100.0	23	100.0

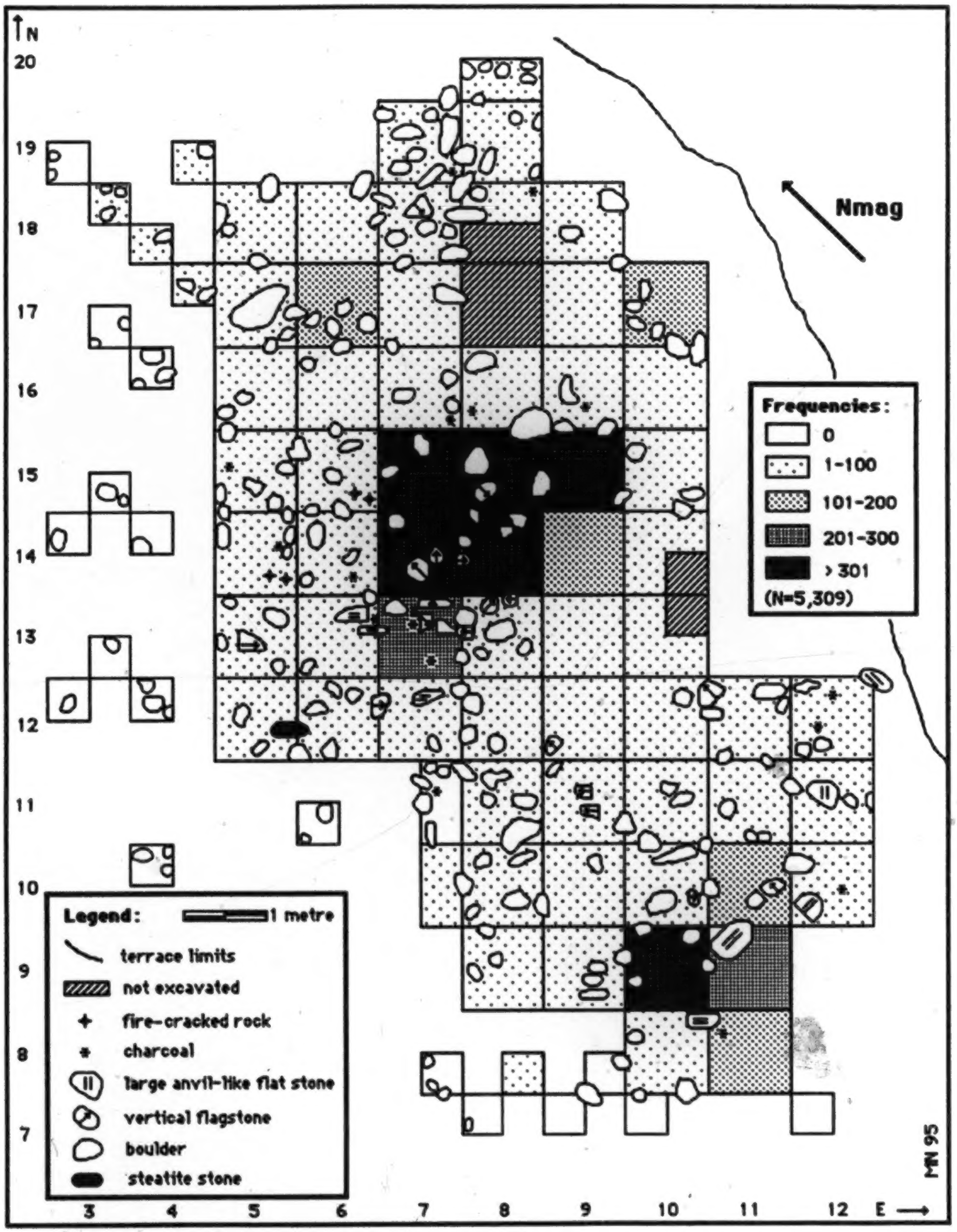

N
Nmag
20
19
18
17
16
15
14
13
12
11
10
9
8
7
3
4
5
6
7
8
9
10
11
12
E
Frequencies:
0
1-100
101-200
201-300
> 301
(N=5,309)
Legend:
1 metre
terrace limits
not excavated
fire-cracked rock
charcoal
large anvil-like flat stone
vertical flagstone
boulder
steatite stone
MN 95

Figure 3.29 Ohituk site, area A (KcFr-3A): Debitage distribution

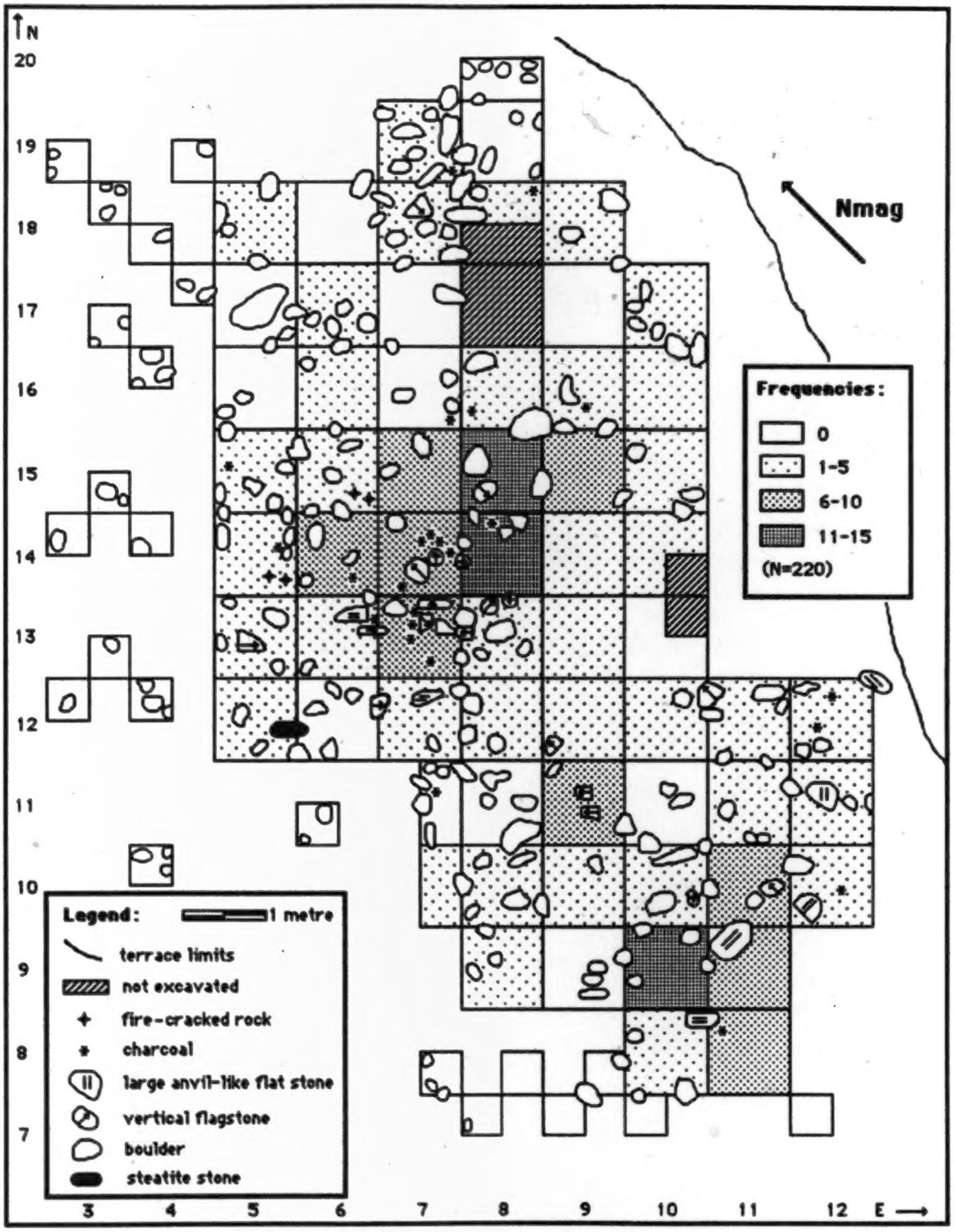

N
20
19
18
17
16
15
14
13
12
11
10
9
8
7
3
4
5
6
7
8
9
10
11
12
E
Nmag
Frequencies:
0
1-5
6-10
11-15
(N=220)
Legend:
1 metre
terrace limits
not excavated
fire-cracked rock
charcoal
large anvil-like flat stone
vertical flagstone
boulder
steatite stone

Figure 3.30 Ohituk site, area A (KcFr-3A): Lithic tools distribution

Figure 3.31 Ohituk site, area A (KcFr-3A): Major lithic tool classes per activity area

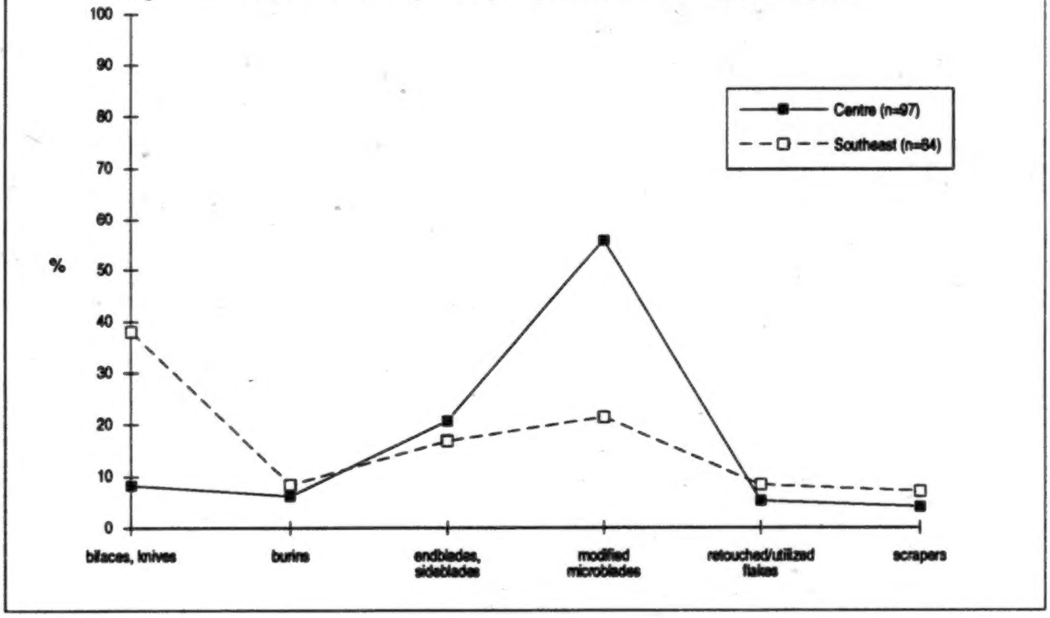


Figure 3.32 Ohituk site, area A (KcFr-3A): Microblades per activity area

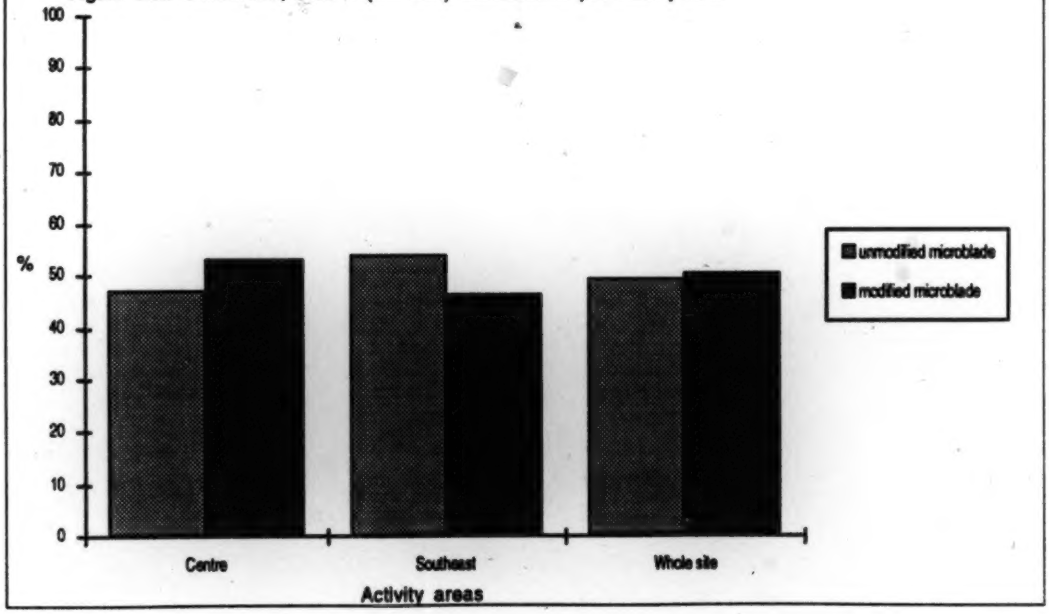


Figure 3.33 Ohituk site, area A (KcFr-3A): Types of burins per activity area

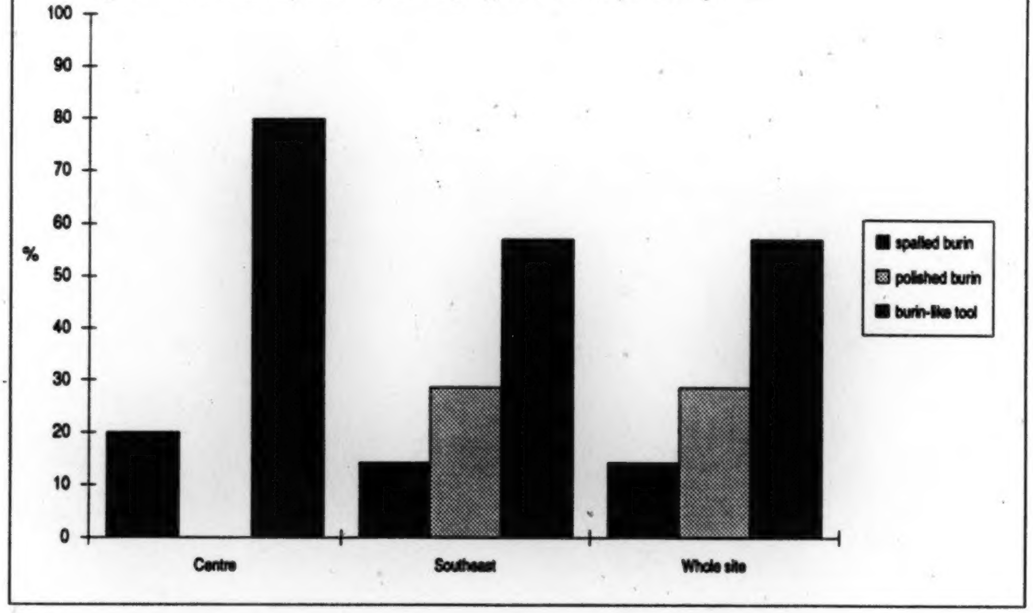


Figure 3.34 Ohituk site, area A (KcFr-3A): Organic materials per activity area

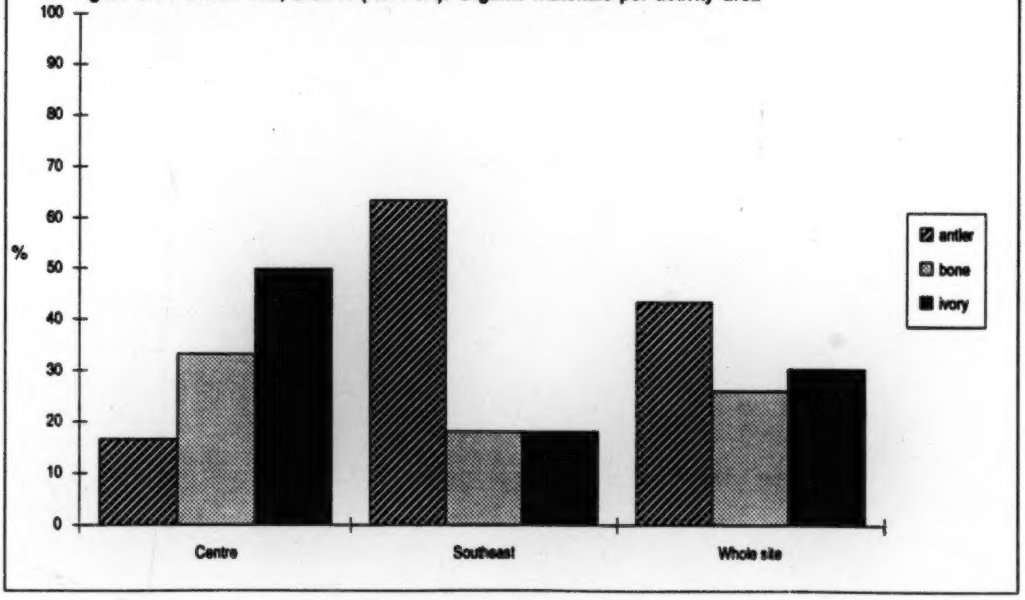
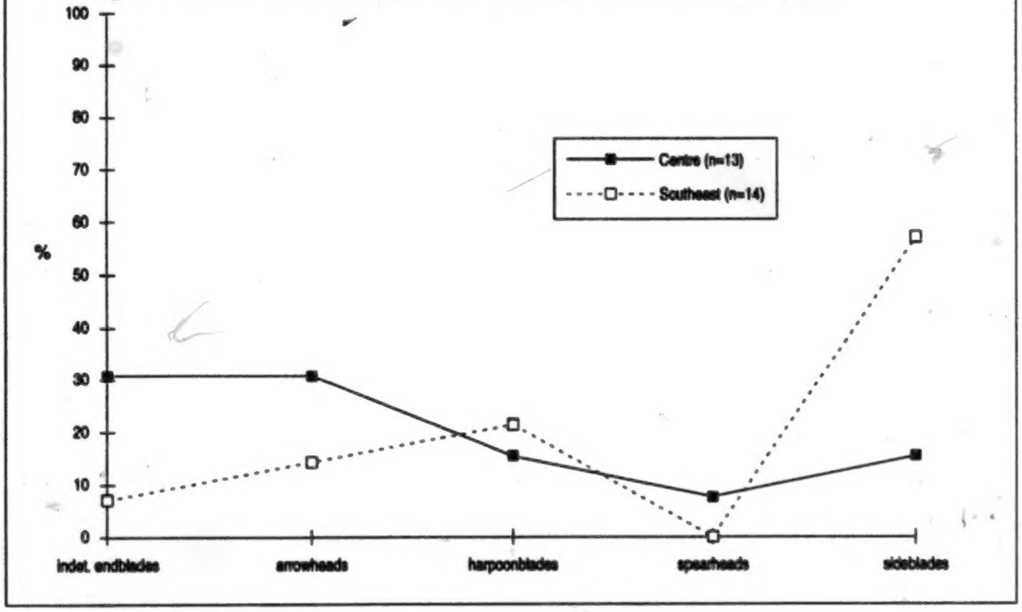


Figure 3.35 Ohituk site, area A (KcFr-3A): Lithic tools for hunting per activity area



broken by mistake or if they were recovered during the butchering of seals, after having been damaged during hunting. The fact that all the harpoon fragments were associated with burins and burin-like tools could indicate that they were being manufactured.

To recapitulate, percentages and spatial distributions of artifacts in area A of the Ohituk site suggest that activities related to tool manufacture took place at the centre of KcFr-3A, very likely in a tent, while butchering activities took place in the southeast section.

Dorset site: Tivi Paningayak, area A (KcFr-8A)

Description

As mentioned earlier, the Tivi Paningayak site (KcFr-8) contains three components and is located at about 900 metres north of the village of Ivujivik in a small valley. Area A, the focus of this section, is at a distance of 25 metres south of area B, on a terrace about 27 metres above sea level. The site measures 65 metres (north-south) by 45 metres (east-west) (Figure 3.36). Twelve habitation structures were originally identified by Aménatech (1985:51) in 1984. Seven were described as semi-subterranean structures and five as tent rings. After testing structures C, E and G without much success, the 1989 excavation concentrated on structures B, A, K and F, for a total of 143 m^2. Lithic artifacts were recovered from a few squares excavated in front of structure I. However, after being told by Mr. Tivi Paningayak that his family camped in this very location in the 1920s, the excavation of structure I was stopped for fear that the archaeological context would be mixed with the remains of that recent occupation.

The stratigraphy of KcFr-8A has two layers. The upper layer (level 1) measures 2 to 10 cm in depth and is composed of moss, lichen and grass. This cultural level contains artifacts and faunal remains from the historical period. Needless to say, these remains were not included in the present study. Level 1 is followed by a dark brown humus mixed with boulders and small gravel. It varies in depth from 5 to 20 cm and corresponds to level 2. That level contained lithic artifacts and faunal remains associated with Palaeoeskimo occupations. The latter are described below.

Structure A is located in the west side of the excavated area. It is a semi-subterranean structure, 4.5 x 3 metres in dimension with a possible small entrance passage as indicated by an area emptied of boulders. The structure was not so much dug in as it was cleared of boulders. Sod patches encountered during the excavation were interpreted as the remains of a small wall that had originally encircled the structure. A large flat rock was found inside the habitation. Since it contained organic residues in the shape of a circle, a lamp was probably put on this rock.

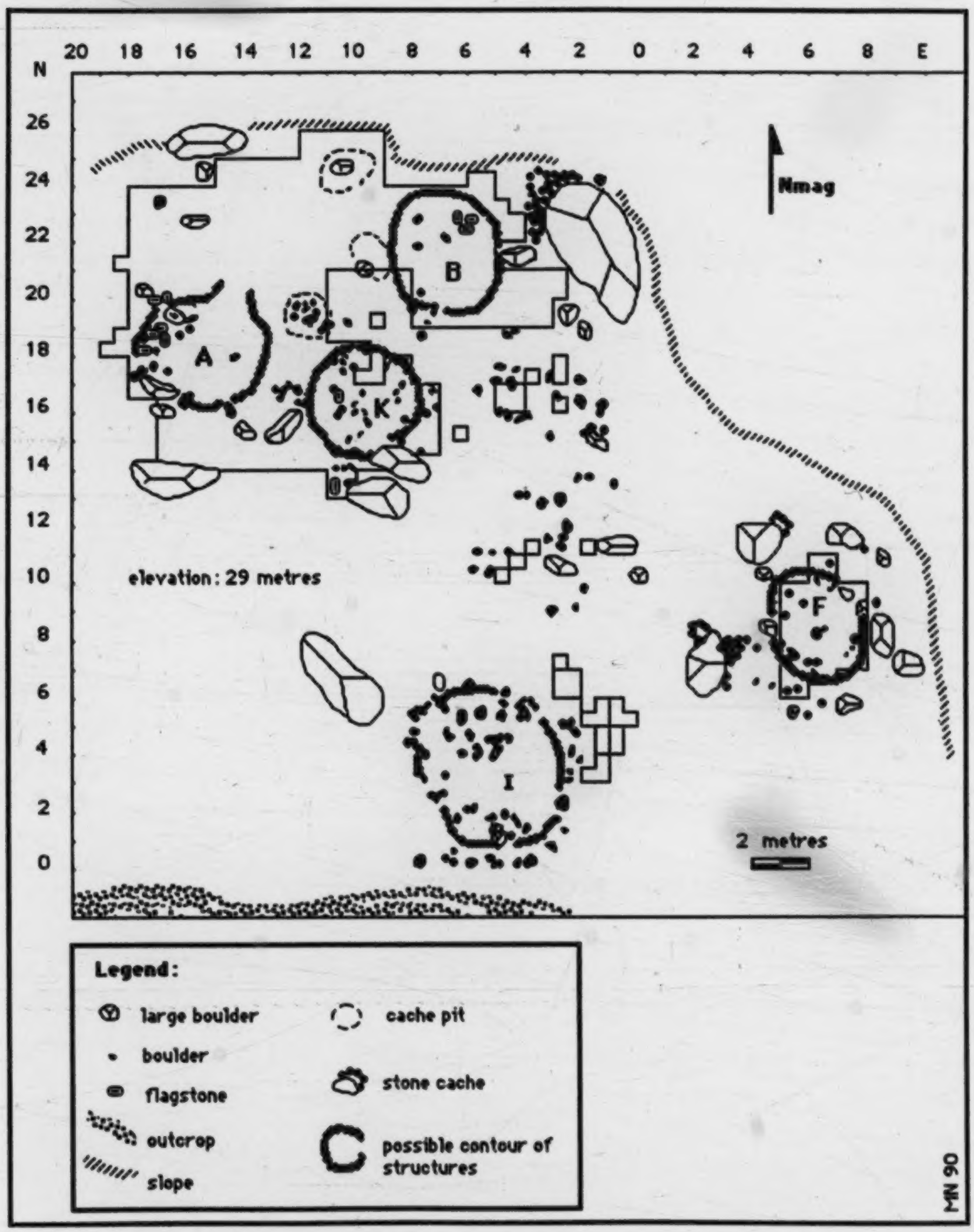

N
20 18 16 14 12 10 8 6 4 2 0 2 4 6 8 E
26 24 22 20 18 16 14 12 10 8 6 4 2 0
Nmag
A
B
K
F
I
elevation: 29 metres
2 metres
Legend:
large boulder
boulder
flagstone
outcrop
slope
cache pit
stone cache
possible contour of structures
MN 90

Figure 3.36 Tivi Paningayak site, area A (KcFr-8A): Excavated units

Structure B is located northwest of the terrace. It is square-shaped (4 m^2) and although described as a semi-subterranean structure by Aménatech (1985:51), it seemed after the excavation, to be a tent-like structure with a small sod wall about 30 cm high.

Structure K (2.5 x 4 metres) is juxtaposed to the eastern part of structure A and was tentatively interpreted as a tent ring. However, since most of this area was associated with numerous boulders, no tent ring was identified. The only evidence for such a ring is the high concentration of lithic artifacts in what was possibly the south wall of the tent. In effect, it seems logical that a tent would be cleaned up from time to time and that lithic discards would end up at the periphery of the habitation. Alternatively, activities might have happened in an open air context.

Structure F is located in the eastern section of KcFr-8A and was also tentatively identified as a tent, about 3 metres in diameter. However, as in the case of structure K, no tent ring was positively identified and it is also possible that this was an open air area of activities.

At KcFr-8A, 14 stone caches were identified but as the site was utilized during the 1920s, it is difficult to know which were used during the Dorset period. Nevertheless, three cache pits were found near structures A, B and K.

To summarize, the four structures excavated at the area A of the Tivi Paningayak site can be grouped into two kinds. The first group is illustrated by structures A and B which were more heavily built, possibly for cold weather occupations. The second group contains structures K and F which were tentatively identified as tent rings but could also have been open air activities areas. Both hypotheses would associate K and F with occupations during a warmer season.

Chronology

Although samples from charcoal, wood and sod were collected, it was not possible to obtain radiocarbon dates because of budget limitations. However, the styles of the lithic artifacts are within the Dorset range, most likely during middle Dorset (Plates 34-41).

Nature of occupations

The excavation in area A of the Tivi Paningayak site concentrated in and around structures A, B and K. As indicated earlier, structure A is semi-subterranean with a possible entrance passage while structure B had a small wall of sod around it. Although it was not possible to identify a tent ring around structure K, the high concentration of lithic remains in its periphery suggested that it had been a tent. In the case of structure F, no tent ring was recognized but its location would have been suitable to set a tent. Furthermore, the presence of lithic debitage and few tools indicate that tool making was undertaken in this area of the site. However, since it is not certain whether or not there was a tent in that location, structure F will be referred to as "area F" to avoid any presumptions regarding its original function.

Although it is difficult to decide if two or more of the structures were occupied at the same time, interpretations can be made from the spatial distribution of exotic or uncommon lithic materials. The most numerous of these materials were a siltstone with quartz, unrecorded so far at any of the other sites from Ivujivik, and a glossy chert. These materials were found mainly in structure K, south and near the entrance of structure A and in few instances at structure B. The fact that they were not found inside structure A is intriguing and may indicate that these remains were deposited before structure A was built. In effect, in the process of digging the ground to build structure A, lithic remains from previous occupations were probably displaced. This would explain why they were found around the house but not inside. This would strongly suggests that only the inhabitants of structures B and K used siltstone with quartz and glossy chert.

Black quartzite was found near the entrance of structure A and inside structure K. Here again, it seems that its association with structure A might be fortuitous. Furthermore, a green quartzite, also unrecorded so far at the Ivujivik sites, was only found in a small flake scatter beside the southeast wall of structure B. The presence of these exotic quartzites implies travels and/or trade with people from the Ungava/Labrador region where they most likely originated. None of the above comments apply to area F where no exotic lithic materials were found. However, one type of uncommon chert was associated only with that location.

In summary, it is suggested that structures B and K were occupied at the same time or by people having similar access to exotic lithic materials. Structure A was probably occupied after structures B and K because it seems that during its construction exotic materials found in the latter were displaced.

Raw materials and artifact distributions

In area A of the Tivi Paningayak site, the 5,993 lithic artifacts recovered were mainly composed of debitage which represents 96.8% of the assemblage (Table 3.29). Modified microblades (19.8%) and endblades (18.7%) are the most common among the 187 worked or utilized lithic objects. They are followed by knives (15.5%) and burins (11.2%) (Table 3.30).

The most abundant raw material is chert (48.5%), followed by four types of quartz which amount to 38.8% of the raw materials (Table 3.28). Among the different quartzes, the milky (14.7%) and crystal (13.6%) varieties are the most common. Other lithic materials are hyaline quartz, coarse quartz, quartzite, siltstone, shale, nephrite, steatite, slate, rhyolite, basalt, metabasalt, phyllite and schist. Objects made of organic materials were also found (Table 3.35). Of these, ivory (62.5%) is the most common, followed by bone (25%) (Table 3.36).

Activity areas

Throughout the site, lithic artifacts were recovered in various frequencies (Figures 3.37, 3.38). The highest concentrations of debitage were found in structures A and K (Figure 3.37). In the case of structure A, activities linked to tool manufacture and maintenance took place in the east and south sections while cooking was done in the west part. In effect, cooking is suggested by the presence of a large rectangular stone whose top had burnt organic remains in a circular pattern indicating that a lamp had been used at that location. Incidentally, two lamp fragments were recovered at the site: one in the entrance of structure A and one beside the west wall of structure B.

When the percentages of the major lithic tool classes are compared for structures A, B, K, and area F, at least one pattern emerges (Figure 3.39). The pattern is shared by structures A and B, which contain high percentages of modified microblades followed by endblades/sideblades and burins. The distribution of tool classes at structure K is identical to the one generated by all the tools from the site: high percentage of endblades/sideblades followed closely by modified microblades and then by bifaces/knives and finally by burins. The presence of endblades/sideblades and burins indicates that the manufacture of hunting tools was undertaken in these structures. In the case of the modified microblades, as indicated earlier in the text, they could have been used in cutting meat and/or skins.

Few tools were recovered in area F and the most represented tool class was the bifaces/knives. These tools and the associated debitage could indicate that bifaces/knives were manufactured there or that they were used in butchery activities.

Microblades were found in all structures and areas of activities (Table 3.32). The majority were unmodified (58.9%), which suggests that microblades were also manufactured at the site (Figure 3.40). This idea is also reinforced by the presence of microblade cores in structures A, B, K and in area F.

Three types of burins were recovered from the site in the following order from the highest to the lowest number: polished burins, spalled burins and burin-like tools (Table 3.33). Only structure A contained all three types, while structure K contained both polished and spalled burins, and structure B had only one spalled burin (Figure 3.41). The few burin spalls found at the site (N=7) indicate that the working edges of burins were mostly polished rather than spalled, a technique intensified over time with the manufacture of burin-like tools. One of the burin-like tools (Plate 40-i) was a multi-purpose tool as it was manufactured to work also as a scraper and a graver.

Comparisons of tools used for hunting showed that only structure K contained sideblades (Figure 3.42). This situation is difficult to explain, but it is possible that some sideblade fragments were included in the indeterminate endblades category. This would mean that sideblades were possibly used by the occupants of the other structures. The low number of endblades identifiable to specific functional categories made comparisons between structures difficult. However, it demonstrated that structures A and K had similar percentages of harpoon blades. Small endblades were tentatively identified as arrowheads and were present in all structures with the exception of structure K. Although harpoon endblades (N=6) were recovered at the site, only one organic artifact was identified as a possible harpoon fragment (Plate 41-a). This situation is unusual particularly since the site contained many seal bones (see Chapter 4). However, it may indicate that hunting was not the major activity undertaken at the site. Furthermore if structures A and B, which were more sheltered than simple tents, were occupied during cold months, it is possible that people lived mostly on food that was cached nearby. As mentioned earlier, many stone caches surround the site and they might have been used by the Dorset people who inhabited the site.

To sum up, structures B and K appear to have been occupied before structure A. Structures A and B are interpreted as cold weather occupations while structure K and area F were used during warmer months. Activities linked to tool manufacture and butchering of animals took place at the site. However, it is unclear whether hunting was a major activity and it is proposed that people may have relied on food cached around the site. This explanation will be tested in the next chapter.

Table 3.28 Tivi Paningayak site, area A (KcFr-8A): Raw materials

Raw material	Number	%	Weight (g)	%
chert	2906	48.49	847.10	12.14
quartz				
milky	884	14.75	1007.40	14.44
crystal	815	13.60	244.90	3.51
hyaline	381	6.36	1895.90	27.18
coarse	248	4.14	1216.00	17.43
quartz totals	*2328*	*38.85*	*4364.20*	*62.55*
quartzite	350	5.84	840.00	12.04
siltstone	150	2.50	157.10	2.25
shale	243	4.05	154.40	2.21
nephrite	5	0.08	253.40	3.63
steatite	3	0.05	83.40	1.20
slate	2	0.03	18.00	0.26
rhyolite	2	0.03	14.80	0.21
basalt	1	0.02	15.90	0.23
metabasalt	1	0.02	1.60	0.02
phyllite	1	0.02	15.80	0.23
schist	1	0.02	211.10	3.03
Totals	5993	100.00	6976.60	100.00

Table 3.29 Tivi Paningayak site, area A (KcFr-8A): Categories of lithic artifacts

Lithic artifacts	Number	%	Weight (g)	%
Debitage				
flakes and shatters	5619	93.76	1225.60	17.57
cores and core fragments	119	1.99	4567.00	65.46
unmodified microblades	53	0.88	11.90	0.17
microblade core fragments	7	0.12	55.40	0.79
burin spalls	5	0.08	0.70	0.01
burin-like tool spalls	2	0.03	0.70	0.01
tip-fluted spall	1	0.02	0.30	0.00
Modified flakes and blades				
retouched/utilized flakes	14	0.23	28.20	0.40
modified microblades	37	0.62	13.00	0.19
Bifaces				
endblades	35	0.58	44.70	0.64
knives	29	0.48	110.80	1.59
bifaces	8	0.13	60.70	0.87
sideblades	7	0.12	7.10	0.10
knife preforms	3	0.05	10.30	0.15
Burins				
burins	21	0.35	31.50	0.45
burin-like tools	5	0.08	5.10	0.07
Scrapers				
endscrapers	9	0.15	236.70	3.39
sidescrapers	5	0.08	10.90	0.16
endscraper preforms	2	0.03	6.20	0.09
Ground and pecked lithics				
abraders	2	0.03	46.20	0.66
lamp fragments	2	0.03	26.40	0.38
adze fragment	1	0.02	9.00	0.13
carving preform	1	0.02	57.00	0.82
hammer	1	0.02	400.80	5.74
polished fragment	1	0.02	2.20	0.03
Miscellaneous				
gravers	2	0.03	2.00	0.03
drill	1	0.02	5.80	0.08
tool fragment	1	0.02	0.60	0.01
Totals	5993	100.00	6976.6	100.00

Debitage	Number	%	Weight (g)	%
Total	5806	96.88	5861.60	84.02

Worked or utilized lithic objects	Number	%	Weight (g)	%
Totals	187	3.12	1115.00	15.98

Table 3.30 Tivi Paningayak site, area A (KcFr-8A):
Frequencies and % of debitage and worked/utilized lithic objects

Lithic artifacts	N	%
Debitage		
flakes and shatters	5619	96.78
cores and core fragments	119	2.05
unmodified microblades	53	0.91
microblade core fragments	7	0.12
burin spalls	5	0.09
burin-like tool spalls	2	0.03
tip-fluted spall	1	0.02
Totals	5806	100.00
Worked or utilized lithic objects		
modified microblades	37	19.8
endblades	35	18.7
knives	29	15.5
burins	21	11.2
retouched/utilized flakes	14	7.5
endscrapers	9	4.8
bifaces	8	4.3
sideblades	7	3.7
burin-like tools	5	2.7
sidescrapers	5	2.7
knife preforms	3	1.6
endscraper preforms	2	1.1
abraders	2	1.1
lamp fragments	2	1.1
gravers	2	1.1
adze fragment	1	0.5
carving preform	1	0.5
hammer	1	0.5
polished fragment	1	0.5
drill	1	0.5
tool fragment	1	0.5
Totals	187	100.0

Table 3.31 Tivi Paningayak site, area A (KcFr-8A):
Major lithic tool classes per structure/activity area

Lithic tools	Habitation structures/activity areas									
	A		B		K		F		Whole site	
	N	%	N	%	N	%	N	%	N	%
bifaces, knives	4	15.4	0	0.0	6	20.0	4	57.1	37	21.8
burins (+ burin-like tools)	6	23.1	1	11.1	5	16.7	0	0.0	26	15.3
endblades, sideblades	6	23.1	2	22.2	8	26.7	1	14.3	42	24.7
modified microblades	8	30.8	5	55.6	7	23.3	1	14.3	37	21.8
retouched/utilized flakes	1	3.8	0	0.0	3	10.0	0	0.0	14	8.2
scrapers	1	3.8	1	11.1	1	3.3	1	14.3	14	8.2
Totals	26	100.0	9	100.0	30	100.0	7	100.0	170	100.0

Table 3.32 Tivi Paningayak site, area A (KcFr-8A):
Microblades per habitation structure / activity area

Microblades	Habitation structures / activity areas									
	A		B		K		F		Whole site	
	N	%	N	%	N	%	N	%	N	%
unmodified microblades	10	55.6	8	61.5	7	50.0	1	50.0	53	58.9
modified microblades	8	44.4	5	38.5	7	50.0	1	50.0	37	41.1
Totals	18	100.0	13	100.0	14	100.0	2	100.0	90	100.0

Table 3.33 Tivi Paningayak site, area A (KcFr-8A):
Types of burins per habitation structure / activity area

Burins	Habitation structures / activity areas									
	A		B		K		F		Whole site	
	N	%	N	%	N	%	N	%	N	%
spalled burins	2	33.3	1	100.0	1	25.0	0	0.0	9	34.6
polished burins	3	50.0	0	0.0	3	75.0	0	0.0	12	46.2
burin-like tools	1	16.7	0	0.0	0	0.0	0	0.0	5	19.2
Totals	6	100.0	1	100.0	4	100.0	0	0.0	26	100.0

Table 3.34 Tivi Paningayak site, area A (KcFr-8A):
Lithic tools for hunting per habitation structure / activity area

Lithic tools	Habitation structures / activity areas									
	A		B		K		F		Whole site	
	N	%	N	%	N	%	N	%	N	%
endblade (indet.)	6	75.0	1	50.0	4	44.4	0	0.0	23	54.8
endblade (arrow)	1	12.5	1	50.0	0	0.0	1	100.0	6	14.3
endblade (harpoon)	1	12.5	0	0.0	1	11.1	0	0.0	6	14.3
endblade (spear)	0	0.0	0	0.0	0	0.0	0	0.0	1	2.4
sideblade	0	0.0	0	0.0	4	44.4	0	0.0	6	14.3
Totals	8	100.0	2	100.0	9	100.0	1	100.0	42	100.0

Table 3.35 Tivi Paningayak site, area A (KcFr-8A): Organic artifacts

Artifact categories	Number	%
Debitage		
flakes	4	50.0
blank	1	12.5
worked fragment	1	12.5
Subtotals	6	75.0
Finished implements		
harpoon fragment	1	12.5
polished tooth	1	12.5
Subtotals	2	25.0
Totals	8	100.0

Table 3.36 Tivi Paningayak site, area A (KcFr-8A):
Organic materials per habitation structure/activity area

Organic materials	Habitation structures/activity areas									
	A		B		K		F		Whole site	
	N	%	N	%	N	%	N	%	N	%
antler	0	0.0	0	0.0	0	0.0	0	0.0	1	12.5
bone	0	0.0	1	100.0	1	50.0	0	0.0	2	25.0
ivory	0	0.0	0	0.0	1	50.0	0	0.0	5	62.5
Totals	0	0.0	1	100.0	2	100.0	0	0.0	8	100.0

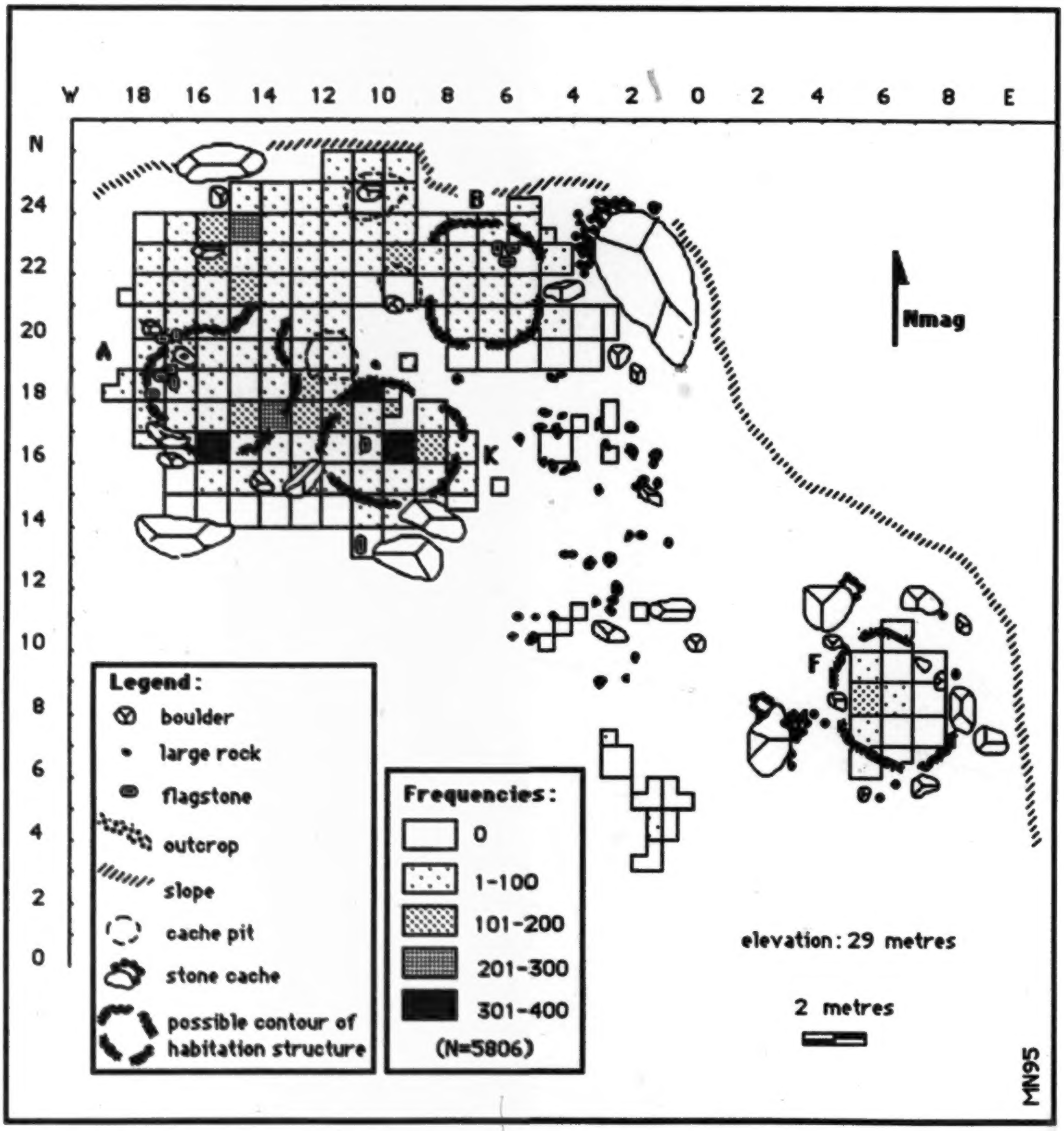

W
18
16
14
12
10
8
6
4
2
0
2
4
6
8
E
N
24
22
20
18
16
14
12
10
8
6
4
2
0
A
B
D
K
F
Nmag
Legend:
boulder
large rock
flagstone
outcrop
slope
cache pit
stone cache
possible contour of habitation structure
Frequencies:
0
1-100
101-200
201-300
301-400
(N=5806)
elevation: 29 metres
2 metres
MN95

Figure 3.37 Tivi Paningayak site, area A (KcFr-8A): Debitage distribution

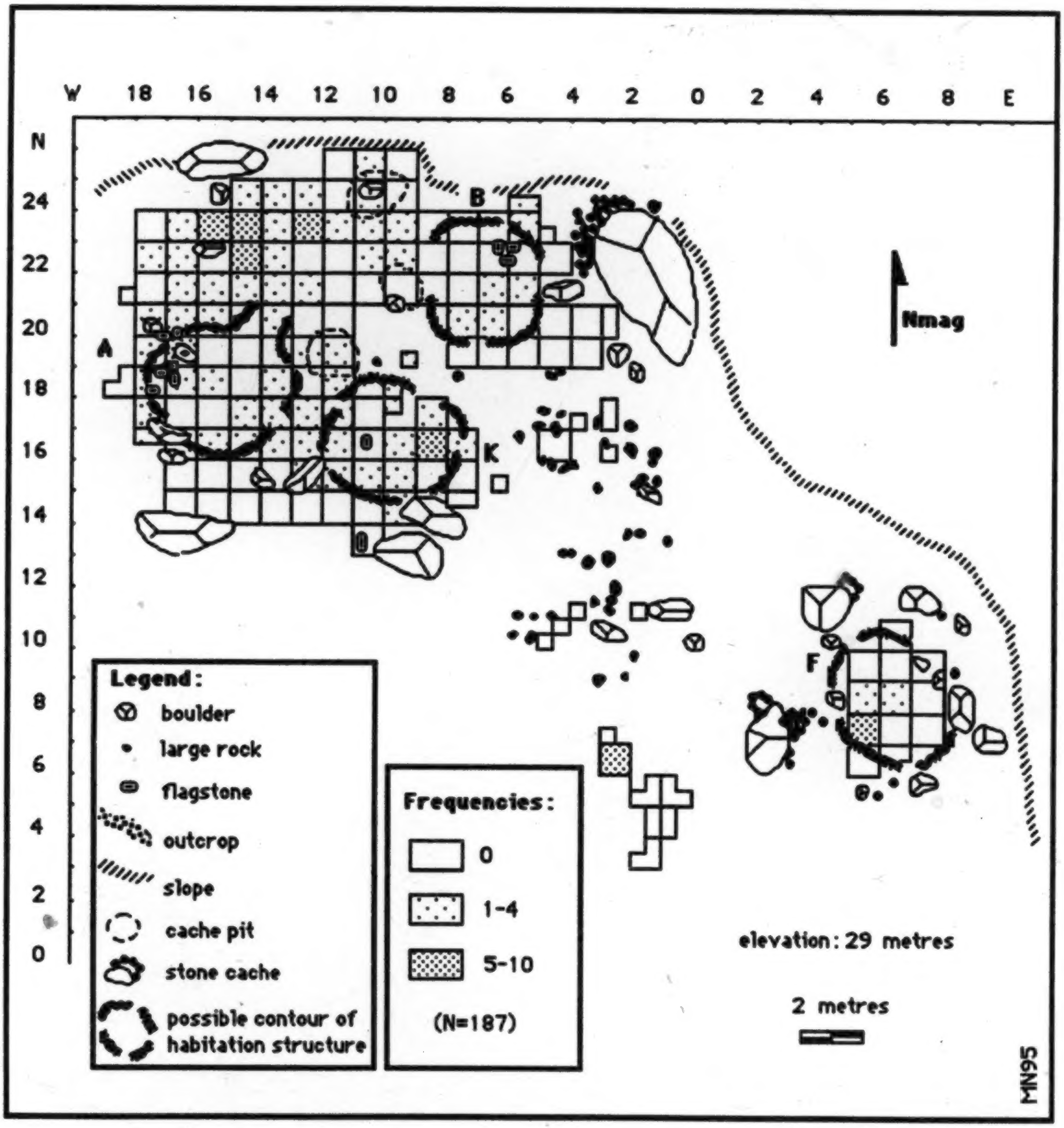

W
18
16
14
12
10
8
6
4
2
0
2
4
6
8
E
N
24
22
20
18
16
14
12
10
8
6
4
2
0
A
B
K
F
Nmag
Legend:
boulder
large rock
flagstone
outcrop
slope
cache pit
stone cache
possible contour of habitation structure
Frequencies:
0
1-4
5-10
(N=187)
elevation: 29 metres
2 metres
MN95

Figure 3.38 Tivi Paningayak site, area A (KcFr-8A): Lithic tools distribution

Figure 3.39 Tivi Paningayak site, area A (KcFr-8A): Major lithic classes per structure/activity area

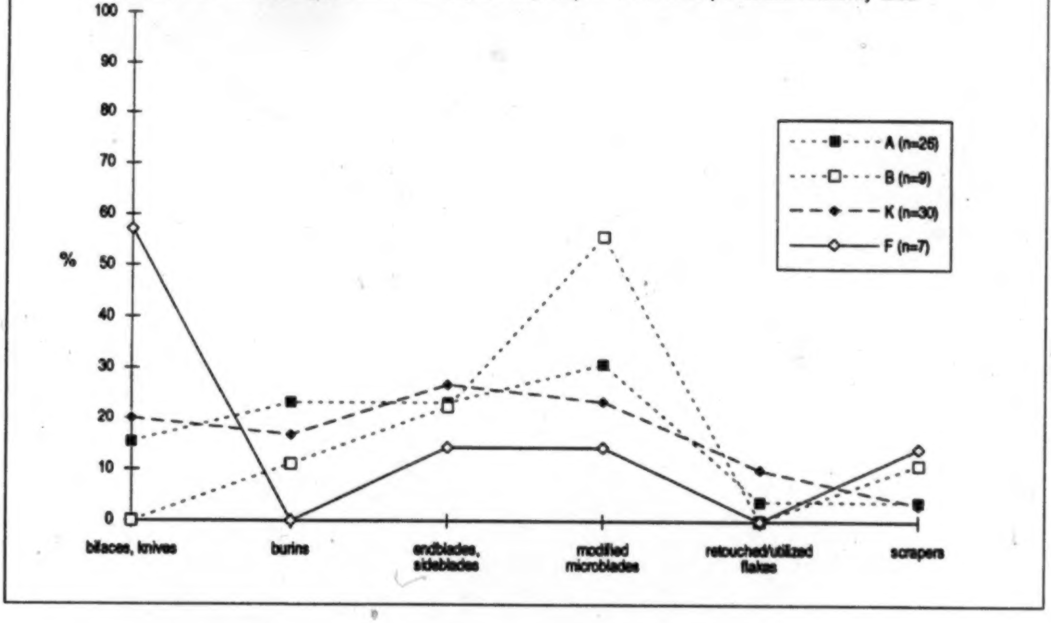


Figure 3.40 Tivi Paningayak site, area A (KcFr-8A): Microblades per structure/activity area

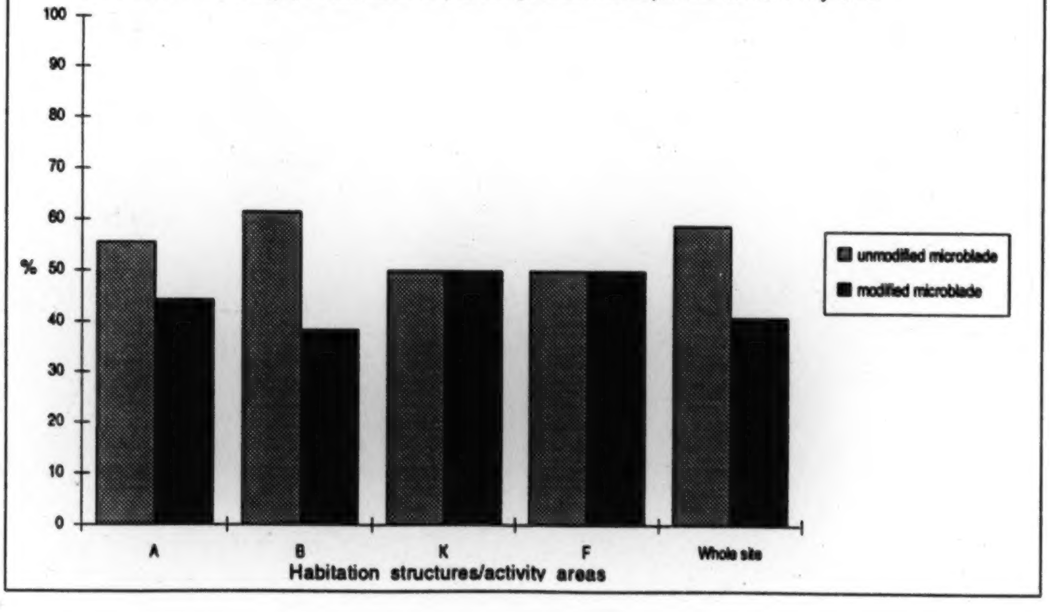


Figure 3.41 Tivi Paningayak site, area A (KcFr-8A): Types of burins per structure/activity area

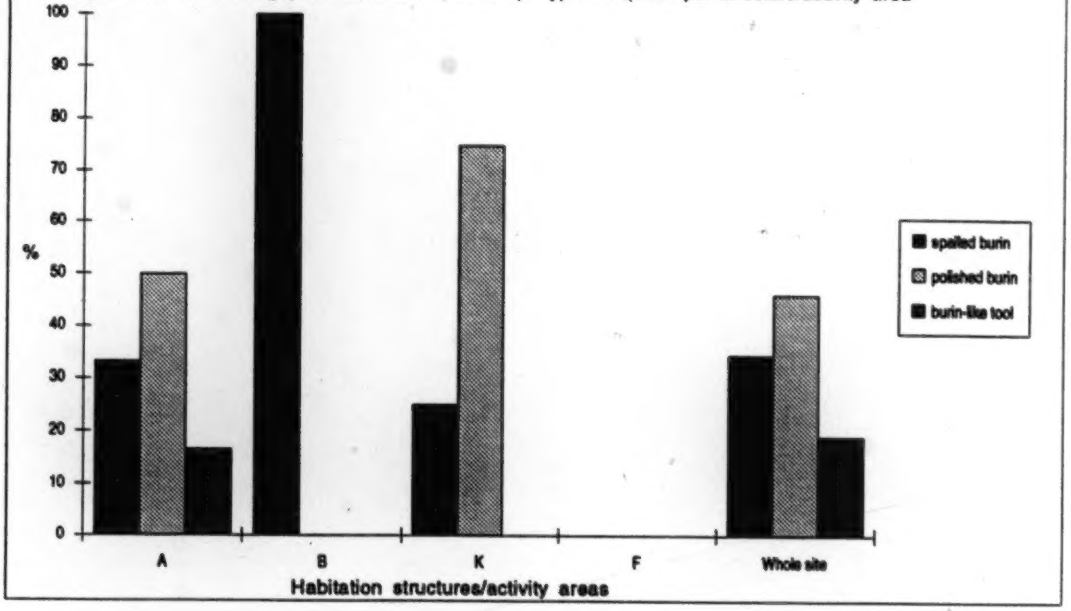
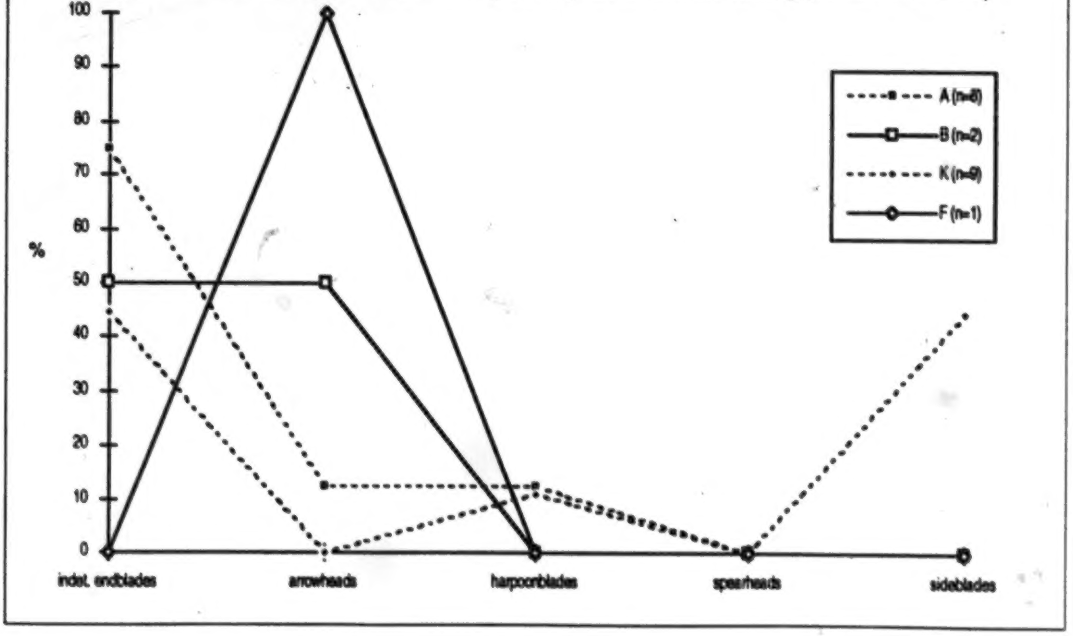


Figure 3.42 Tivi Paningayak site, area A (KcFr-8A): Lithic tools for hunting per structure/activity



CHAPTER 4

Utilization of faunal resources by Palaeoeskimo people

Introduction

This chapter concerns the utilization of animals by Palaeoeskimo people who exploited the Ivujivik area. At the beginning of the chapter, the faunal resources available in the Ivujivik region are reviewed. Then, the zooarchaeological methods utilized during the analysis of the faunal assemblages are introduced. It is followed by a description of the faunal material from each site. Finally, interpretations on the selection and use of animals are presented.

Sea mammals

Seals are the major marine mammals available near Ivujivik. The two main species present throughout the year are the ringed seal (*Phoca hispida*; "nassiq" in Inuktitut) and the bearded seal (*Erignathus barbatus*; "ujjuk"). The harp seal (*Phoca groenlandica*; "qairulik") and the harbour seal (*Phoca vitulina*; "qasigiaq") are migratory species that can also be found but they are not numerous and thus less hunted by the Inuit of Ivujivik (Ivujivimiut) (Roy 1971a:109). Both the ringed seal and the bearded seal live along the ice floe during the winter. Roy (1971a:112) reports that in general, seals are rare along the coast in July and August but they come back as the ice starts to form again. The main seasons to hunt seals are thus in the spring, autumn, and winter. In the spring, the month of April is the best for hunting ringed seal (Roy 1971a:134). It is probably because lactating females are close to their newborns on the ice-edge and both are easy to kill (Smith 1973: 21). Seals are hunted along the ice-edge from June to August (Roy 1971a:128). At that time they are more likely to sink quickly (and thus to be lost by the hunters) as their blubber content is relatively thin (McLaren 1958: 22-23; Roy 1971a:135). During the winter the seals are hunted in polynyas and at breathing-holes (Roy 1971a:125).

Beluga whale (*Delphinapterus leucas*; "qilalugaq") is another important sea mammal hunted near Ivujivik. Groups of beluga migrate along the south side of Hudson Strait in the spring before ice-break and until June and July, during which period they are quite abundant (Roy 1971a:142-143). Their fall migration is from the end of October to mid-November. The best locations to hunt beluga are the same as those for seals (Roy 1971a:147).

Walrus (*Odobenus rosmarus*; "aiviq") can be found along the coast but in practice they are hunted in specific areas like small rocky islands where they can be very numerous in the spring and in the fall. They also tend to come back year after year in the same locations (Roy 1971a:154). They migrate south rapidly from the Hudson Strait from mid-July to the beginning of August. Their second migration, which is slower, occurs between mid-September and the beginning of October (Roy 1971a:158). Walrus are fairly rare in the vicinity of the Ivujivik Peninsula but they were reported in great number near Saarqajaaq and Qikirtasiq (Digges Islands) at the end of the last century (Bell 1884:33). In the 1960s, the Ivujivimiut preferred to hunt walrus in the fall north of Ivujivik, on and around Tujjaat (Nottingham Island) and Akulliq (Salisbury Island) (Roy 1971a: 157, 160). Walrus were also hunted in the 1950s during the winter on the ice-edge near Pujjunaq (Mansel Island).

Other sea mammals that can also be found near Ivujivik are the narwhal (*Monodon monoceros*; "allanguuaq"), more rarely, the killer whale (*Orcinus orca*; "arluk") and the bowhead whale (*Balaena mysticetus*; "arvik"). However, none of these three large species have been hunted since at least the end of the last century (Roy 1971a:170).

Land mammals

Small land mammals

The small mammals that can be found in the Ivujivik region are the arctic fox, the red fox, the ermine, the arctic hare, the sea otter and the mink (Banfield 1981). Among the foxes, the arctic fox and the red fox are the most numerous (Roy 1971a:172). Wolverine is rare (Roy 1971a:196) but was in the region during the last century (Bell 1884:50). Wolves were present at the beginning of the century when caribou herds came by the coast (Low 1902:21) but they have now disappeared since caribou are not present anymore (Roy 1971a:198).

Large land mammals

The polar bear (*Ursus maritimus*; "nanuq") lives essentially near the coast and rarely goes far inland. They are hunted to the northwest of Tujjaat (Nottingham Island), the northwest of Akulliq (Salisbury Island) and on the west side of Pujjunaq (Mansel Island) (Roy 1971a:198-199). Polar bears occasionally venture onto the Ivujivik Peninsula and are also found on Saarqajaaq (one of the two Digges Islands). Polar bears can be hunted year round because only the females and their cubs hibernate (Banfield 1981:311; Roy 1971a: 202).

Caribou (*Rangifer tarandus*; "tuttu") has not been seen near Ivujivik for at least the last 60 years but they can be hunted inland, south and east of Ivujivik (Roy 1971a:256). Low (1902:18) mentioned that until the end of the last century caribou used to migrate through the Ivujivik region. Their presence is also indicated by an island named Nullakallak, which refers to a caribou crossing (Vézinet 1980:88). Although the caribou migrated south in the autumn, some were reported to spend the winter near Wakeham Bay, north of Ivujivik (Bell 1884:27). Traditionally, caribou was mostly hunted inland (Roy 1971a:257).

Birds

The Ivujivik region and its coastal islands are plentiful in birds of economic value to the Ivujivimiut. Most birds are migratory, arriving in the spring and leaving in the autumn. The most exploited species by the Ivujivimiut are the thick-billed murre, the common eider, the black guillemot, the willow ptarmigan, the Canada goose and the snow goose (Roy 1971a:223, 225). The thick-billed murre (*Uria lomvia*; "appaq") is a sea bird with huge nesting colonies in Saarqajaaq and Qikirtasiq (Digges Islands) numbering at least two million individuals in 1955 (Tuck 1965:74). The thick-billed murre migrates to these islands from the beginning of April to mid-May and starts the southeast migration in mid-September (Roy 1971a:229). The murres are the most intensively hunted birds by the Ivujivimiut and their eggs are also eaten in the spring. The common eider (*Somateria mollissima*; "mitiq") also arrives in the region in the spring and leaves in the autumn. Some of the common eider stay in the Hudson Bay during the winter (Roy 1971a:231). The black guillemot (*Cepphus grylle*; "pissiulaq") can be found all year round near Ivujivik and along the coast. The willow ptarmigan (*Lagopus lagopus*; "aqiggiq") can be found all year round since it migrates south only if the snow if too deep (Roy 1971:235). However, they are more numerous, and thus most hunted during the first three weeks of March, when those who had migrated come back. A second species of ptarmigan, of smaller size, is the rock ptarmigan (*Lagopus mutus*; "aqiggivit").

The fifth bird of economic importance is the Canada goose (*Branta canadensis*; "nirliq"). It migrates though the Ivujivik region during the last two weeks of May and the first week of June and is usually absent from the area by the end of June. Canada Geese fly through the region during their southern migration from late August to mid-September. Snow geese (*Anas caerulescens*; "kanguq") are present in the Ivujivik region at the same time as the Canada goose but the fact that less of them are caught probably indicates that they do not spend as much time in the area (Roy 1971a:241).

Fish and molluscs

The most abundant species of fish are the arctic char (*Salvelinus sp.*; "iqaluppik") and three types of trout (red, brook and lake). Arctic char is a migratory species that travels from lakes to the sea and vice versa. It can be found all year long in lakes where it is usually more abundant (Roy 1971a:213). The red trout (*Salvelinus sp.*; "ivitaruq") and the brook trout (*salvelinus sp.*; "nutilliq") can be found in lakes all year long. The lake trout (*Salvelinus sp.*; "isiuralittaaq") can be found in lakes and rivers.

Two species of molluscs are exploited by the Ivujivimiut: the mussel (*Mytilus*; "uviluq") and the clam (*Mya* or *Venus*; "ammuumajuq"). Both can be found all year round in the region although they are more difficult to get in the winter.

Zooarchaeological methods

The quantitative units used in this study are NISP, MNI, MNE and MAU. Much discussions have risen from the use and misuse of these units (e.g., Grayson 1984; Lyman 1994a, 1994b; Ringrose 1993) and a review of these is beyond the scope of this study. Thus, only a brief definition of each quantitative unit will be presented. NISP is the number of identified specimens per taxon. MNI is the minimum number of individual per taxon. In this study the age and side of bones were taken into consideration to calculate the MNI. MNE is the minimum number of skeletal elements of a taxon without consideration of side. Comparison of NISP and MNE illustrate the degree of fragmentation undergone by the bones. MAU is the minimum number of animal units necessary to account for skeletal parts of a taxon. To calculate MAU, one calculates the MNE and then divides it by the number of times the skeletal part is present in any specific taxon. MAU accounts not only for the degree of fragmentation but also to the fact that skeletal parts are differently represented in a complete skeleton.

In the tables presenting the data, %MNE and %MAU were also used. The %MAU are normed values calculated by equating the most frequent skeletal part to 100 and scaling all the other parts to that value. MNI and MAU values were not calculated for each structure since bones found in caches, middens and between structures, were also part of the animals consumed at the site. Calculations of MNI and MAU for each structure would be limited to bones discarded within tents or houses and would certainly give smaller values than those calculated for the whole site.

Although a meat utility index for phocid seals has been presented by Lyman et al. (1992), it was not used to test the Ivujivik data since its authors concluded there were few significant correlations between the indices and the skeletal part frequencies from archaeological sites. Meat utility indices are used to predict and explain which parts of animals are left at the kill site and which are brought back to camp. In the case of the Ivujivik sites containing faunal remains, they were all located near sea level at the time of their occupation, and it can be reasonably assumed that most carcasses were brought back as complete units to the sites. Ethnoarchaeological data collected in eastern Arctic substantiate this assumption (see Lyman et al. 1992:544). Furthermore, recent attempts by Le Blanc (1994) at using the Lyman et al. (1992) meat utility index with seal remains from a Palaeoeskimo site in the western Canadian arctic proved equally unsuccessful. Le Blanc

(1994:107) concluded that some of the patterns observed in the seal bone frequencies were because of post-depositional attrition, rather than specific transport decisions.

A total of 18,612 bones were analyzed with the help of the bone collection from the Zooarchaeology Laboratory of the Anthropology Department at the University of Alberta. Bones that were difficult to identify owing to lack of comparative material, were sent to zooarchaeologist Anne M. Rick at the Canadian Museum of Nature in Ottawa. Ringed seal and harbour seal are difficult to distinguish, the former being slightly smaller than the latter (Banfield 1981). Since there is little sexual dimorphism between the sexes of both species (King 1983), bones of a ringed seal male could easily be confused with those of a harbour seal female. For these reasons, all bones belonging to *Phoca sp.* were lumped together as "small seal."

The two species are best differentiated by looking at their bulla, mandible and maxilla (Amorosi 1992). Since in all the faunal assemblages only two mandibles (out of an MNE of 158), one maxilla (out of an MNE of 38), and one bulla (out of an MNE of 165) belonged to harbour seal, it is reasonable to assume that most of the small seal bones were from ringed seal. In effect, all the other mandibles (MNE=27) and bullae (MNE=48) identifiable to species belonged to ringed seal. In the case of skeletal elements from large seals that were not identifiable to species, contemporary data on seal species of the Ivujivik region (Roy 1971a, 1971b) would suggest that these were bearded seals.

Pre-Dorset sites

Only one bone was recovered from the north area of the Mangiuk site (KcFr-7). It is a complete first metatarsal from a foetal/newborn small seal. The age of the seal indicates that it died at the end of March or at the beginning of April. The bone was found in structure I and could suggest a spring occupation of the Mangiuk site. However, since the bone was lying only 2 cm from the surface some doubts might be cast on its original provenience. In effect, it may have brought to the site by a carnivore, long after the site was abandoned.

In area B of the Tivi Paningayak site (KcFr-8B), three small seal bones were recovered: a fifth metatarsal and two tibia fragments that fitted together. It was possible to age only the tibia, which belonged to an adult. These few faunal remains do not allow suggestions concerning the season of site occupation. However, since at least some faunal remains were recovered, the otherwise paucity of faunal material might not be due to generally poor preservation conditions but to a very short stay in both sites.

Pre-Dorset/Dorset Transitional sites

Pita (KcFr-5)

Description

A total of 15,572 bones were recovered at the Pita site. Of all the bones analyzed, 84.5% were identifiable to taxon (Table 4.1). The majority of the bones identified to taxon belonged to sea mammals (Tables 4.2-4.4). The most common taxon was small seal (96.20 %NISP and 82.97 %MNI), and as indicated earlier, it was very likely composed almost exclusively of ringed seal.

Spatial distribution of taxa

High bone concentrations came from the midden area and from cache 5 but bones were present in almost all excavated units, especially outside the habitation structures (Figure 4.1) . This situation might be explained by the fact that the site was possibly occupied when there was still snow on the ground. Thus, as Binford (1987:499) noted:

> In that situation, outside use areas are gradually covered by both falling and blowing snow, resulting in uncluttered space on the surface in spite of the build-up of clutter under the snow. The archaeologist sees the accumulation as it has dropped after the snow melts, which certainly gives the appearance of unmaintained space in spite of the fact that during use the debris did not cause cluttered space.

Structure A had few bones, but since it was not excavated entirely, it is possible that more bones would have been found along its west wall. Since bones of small seal were everywhere, the spatial distribution of the birds, land mammals and sea mammals other than small seal, was undertaken to identify possible patterns at the site. The results indicate that most of the bird bones were discarded in the midden area. Structure A did not contain any bird bones. Duck (*Anas sp.*) bones were identified only on the edge of structure C and near cache 4. Eider or scoter bones were only found at the edges of structures C and D, in the midden area, and near cache 4. Murre bones were found in structures B, C and D. All other bird bones were found outside the structures.

The spatial distribution of land mammals was even more informative. In effect, caribou bones were found only in and around structure C and area E, supporting earlier assumptions made in Chapter 4 regarding the contemporaneity of these two areas. Polar bear, arctic hare and red fox bones were found only in structure B. Arctic fox was only associated with structures A, B and D. The distribution of sea mammal bones other than those from small seals indicates that walrus was found in all but structure A. Bones identified as beluga or beluga/narwhal were recovered in all but structures A and C. In the latter case, if cache 1 was used by structure C's inhabitants, then beluga bones were also present. Bearded seal bones were found in all but area E and large whale bones were associated only with structures B, D and area E.

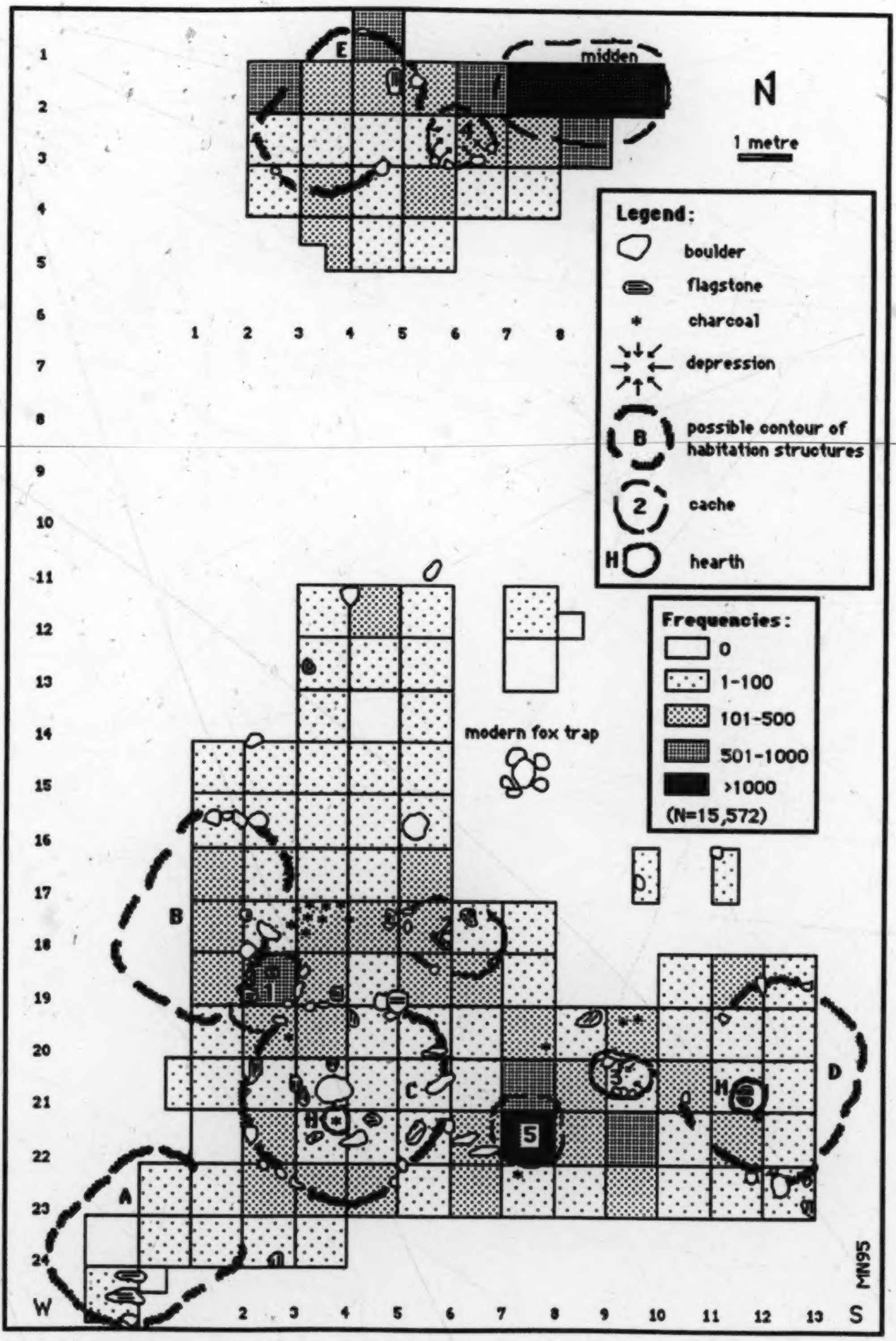
Large mammals

Although small seals are overwhelmingly represented at the Pita site, the presence of larger mammals such as caribou, polar bear, bearded seal and walrus need to be considered since they provided both food (meat, fat, marrow and grease) and raw materials (antler, ivory, hides and fuel) to the people who occupied the site. Thirty-five pieces of antler were recovered at the site but they are not included in figures 4.2 and 4.3 since antler could have been procured from shed specimens. The MNI for caribou is two but the highest MAU is only one because element frequencies are low (Table 4.5). With this consideration in mind, it is not surprising that differences between NISP and MNE values are minimal (Figure 4.2). This suggests that most bones were not heavily broken to render grease. However, the major limb bones (i.e., femur, humerus) had been broken, indicating that marrow was extracted.

The %MAU of caribou skeletal parts indicate that only the front and hind limbs were consumed at the site (Figure 4.3). This pattern suggests that the two caribou were hunted elsewhere, possibly cached, and that only selected parts from the appendicular skeleton were brought back to the Pita site. The possibility remains that parts of the appendicular skeleton were brought back at the site but most bones were so heavily broken through grease rendering that it was impossible to identify them.

In the case of polar bear bones, the MNI is one and differences between NISP and MNE values are also minimal (Figure 4.4). The %MAU of polar bear skeletal parts indicate that as in the case of the caribou, only the front and hind limbs were consumed at the site (Figure 4.3). However, the presence of a complete maxilla and part of the mandible and of a third phalanx suggest that after the inside of the bear was removed, the hide was used to transport the meat (see also Figure 4.5). The polar bear was not aged but the size of the two upper canines attached to the maxilla suggests a subadult or adult individual.

At least three individuals are represented among the bones identified as bearded seal. One was a foetal/newborn, one was a subadult and the last was an adult. For reasons discussed at the beginning of this chapter, bearded seal bones and those only identified as "large seals" were lumped together (Table 3 in Appendices). Differences between NISP and MNE values are minimal (Figure 4.6) with the exceptions of fragments from the cranium, ribs, innominate and ulna, all of which are skeletal parts easily broken. The %MAU of bearded/large seal skeletal parts strongly suggest that these seals were brought back to the site almost complete (Figure 4.7). In order to identify sharing patterns between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W
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2 3 4 5 6 7 8 9 10 11 12 13
S
E
midden
N
1 metre
Legend:
boulder
flagstone
charcoal
depression
B
possible contour of habitation structures
2
cache
H
hearth
Frequencies:
0
1-100
101-500
501-1000
>1000
(N=15,572)
modern fox trap
B
1
H
C
5
H
D
A
MN95

Figure 4.1 Pita site (KcFr-5): Distribution of faunal remains

Table 4.1 Pita site (KcFr-5): Description of faunal assemblage

Description of bones	N	%
Identified to class only	2413	15.5
Identified to taxon (order/family/genus)	13159	84.5
Total	15572	100.0

Table 4.2 Pita site (KcFr-5): Description of faunal assemblage by class

Class	N	%
Unidentified class	13	0.1
Bird	183	1.2
Mammal	15304	98.3
Mollusc	72	0.5
Total	15572	100.0

Table 4.3 Pita site (KcFr-5): Description of faunal assemblage identified to taxon

Taxon	N	%
Bird	85	0.6
Land mammal	137	1.0
Sea mammal	12937	98.3
Total	13159	100.0

Table 4.4 Pita site (KcFr-5): List of taxa

TAXA	NISP	%NISP	MNI	%MNI
Birds				
Anas sp.	10	0.08	5	2.18
Black guillemot	1	0.01	1	0.44
Canada goose	5	0.04	2	0.87
Common snipe	2	0.02	2	0.87
Dovekie	2	0.02	1	0.44
Eider/scoter	21	0.16	6	2.62
Ptarmigan	16	0.12	4	1.75
Snow goose	6	0.05	2	0.87
Thick-billed murre	22	0.17	2	0.87
Subtotal	85	0.65	25	10.92
Land mammals				
Arctic fox	36	0.27	3	1.31
Arctic/red fox	4	0.03	–	–
Arctic hare	1	0.01	1	0.44
Dog/wolf	1	0.01	–	–
Wolf	2	0.02	1	0.44
Caribou	80	0.61	2	0.87
Polar bear	13	0.10	1	0.44
Subtotal	137	1.04	8	3.49
Sea mammals				
Beluga	2	0.02	1	0.44
Beluga/narwhal	15	0.11	–	–
Large whale	10	0.08	1	0.44
Bearded seal	32	0.24	3	1.44
Large seal	54	0.41	–	–
Large seal/walrus	2	0.02	–	–
Small seal (phoca sp.)	12659	96.20	190	82.97
Walrus	163	1.24	1	0.44
Subtotal	12937	98.31	196	85.59
Total identifiable	13159	100.00	229	100.00
Unidentifiable	N	%		
Unid. class	13	0.54		
Unid. mollusc	72	2.98		
Unid. bird	98	4.06		
Unid. mammal	1019	42.23		
Unid. land mammal	70	2.90		
Unid. sea mammal	1141	47.29		
Subtotal	2413	100.00		
Grand total	15572			

Figure 4.2 Pita site (KcFr-5): NISP and MNE of caribou skeletal parts

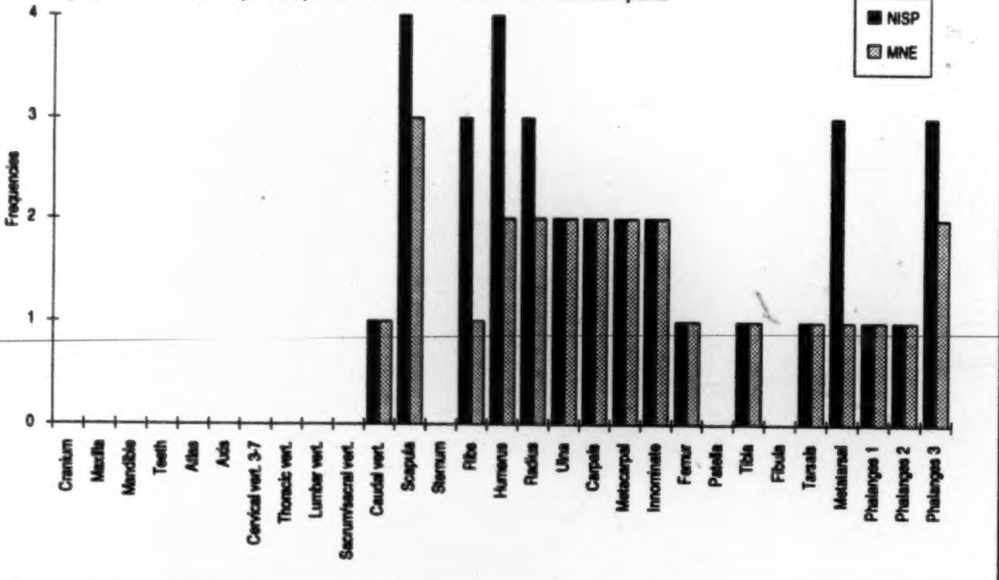


Figure 4.3 Pita site (KcFr-5): %MAU of caribou skeletal parts

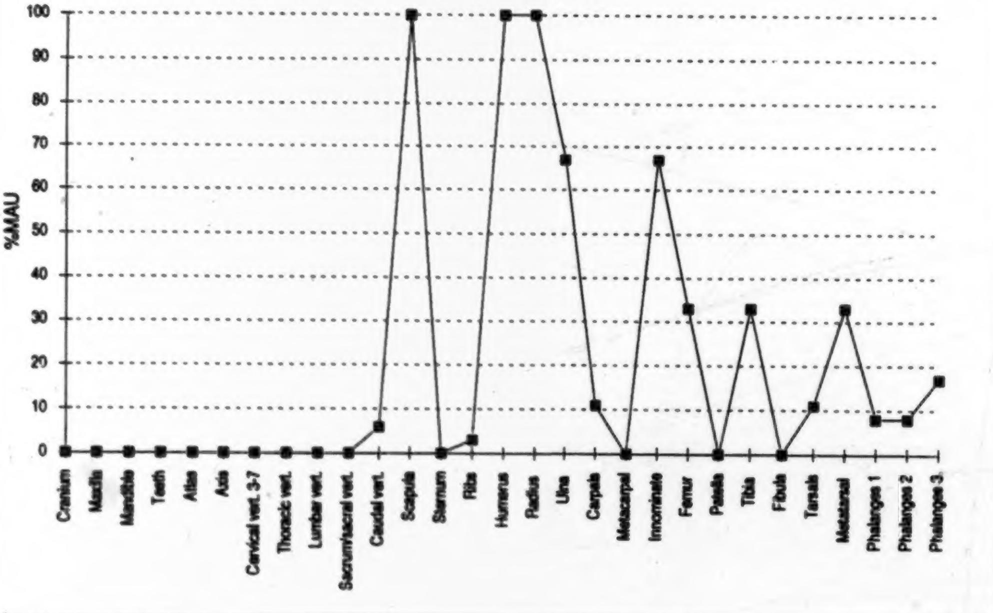


Figure 4.4 Pita site (KcFr-5): NISP and MNE of polar bear skeletal parts

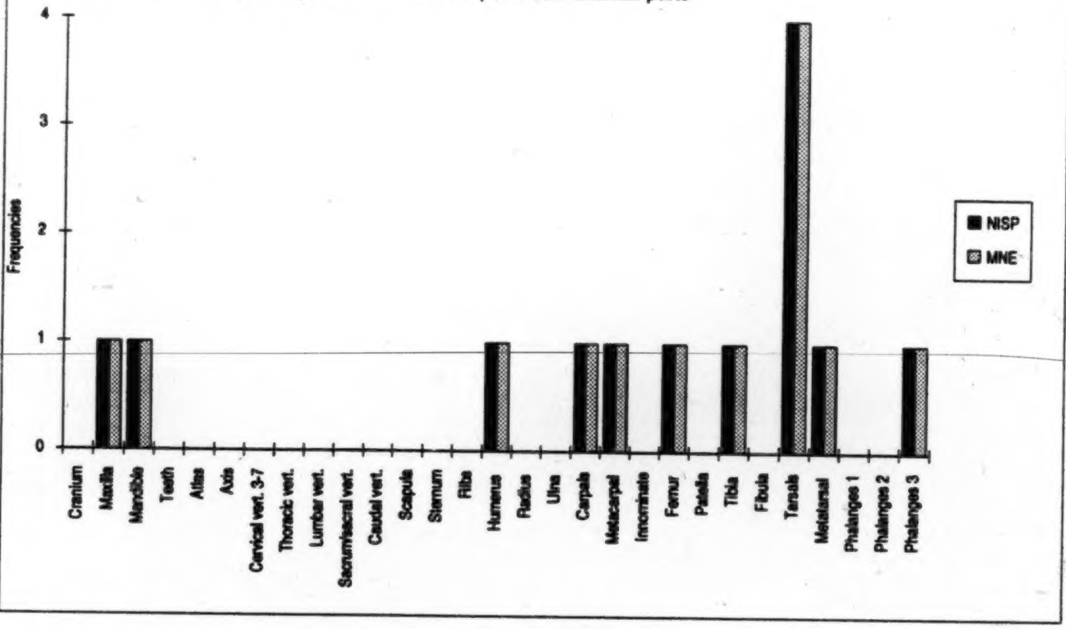
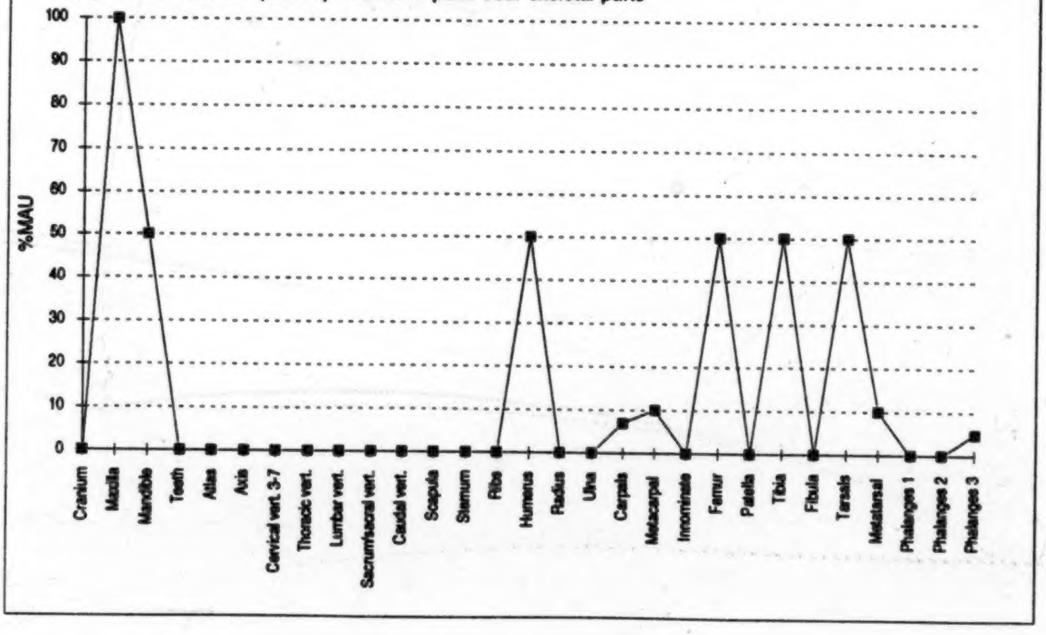


Figure 4.5 Pita site (KcFr-5): %MAU of polar bear skeletal parts



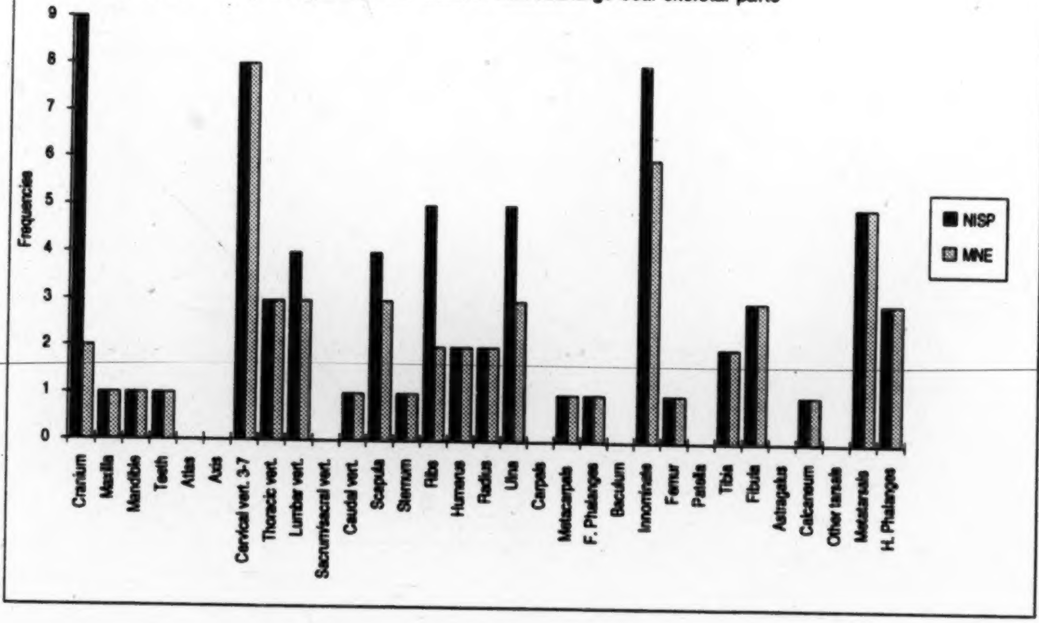


Figure 4.6 Pita site (KcFr-5): NISP and MNE of bearded/large seal skeletal parts

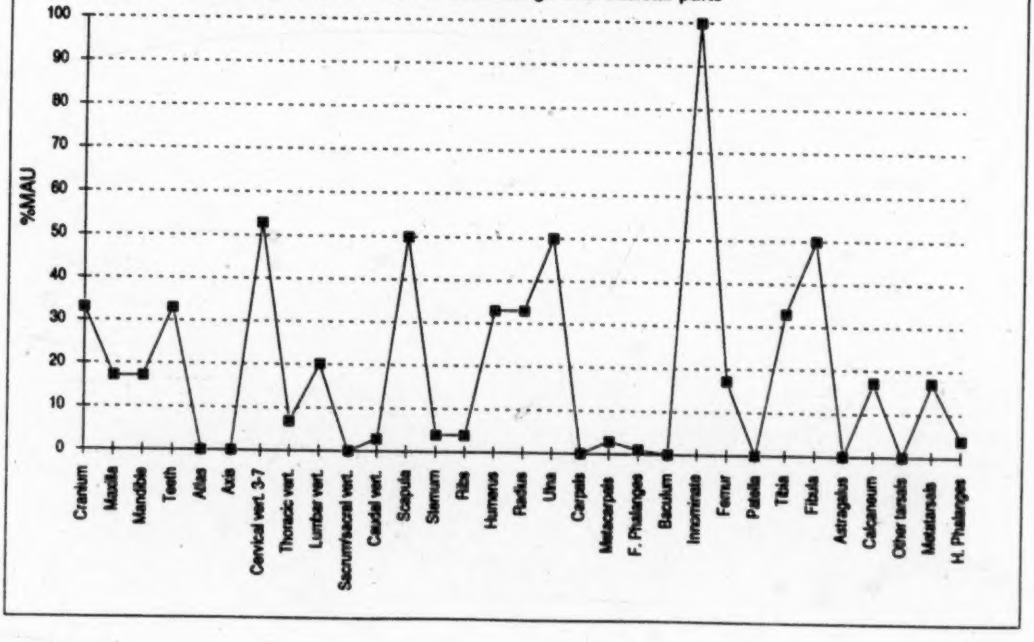


Figure 4.7 Pita site (KcFr-5): %MAU of bearded/large seal skeletal parts

Figure 4.8 Pita site (KcFr-5): NISP and MNE of walrus skeletal parts

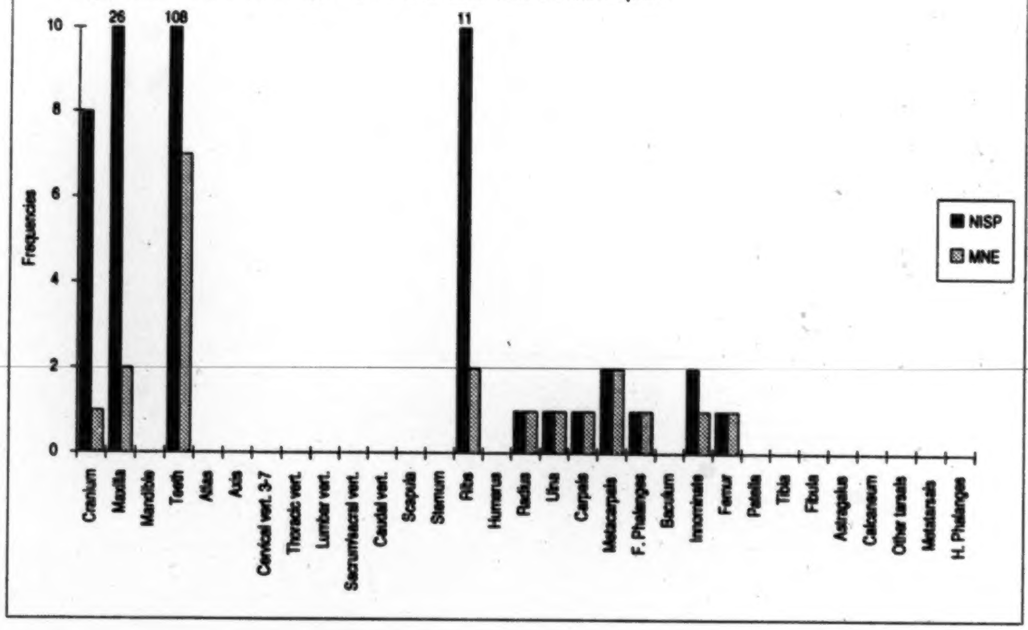
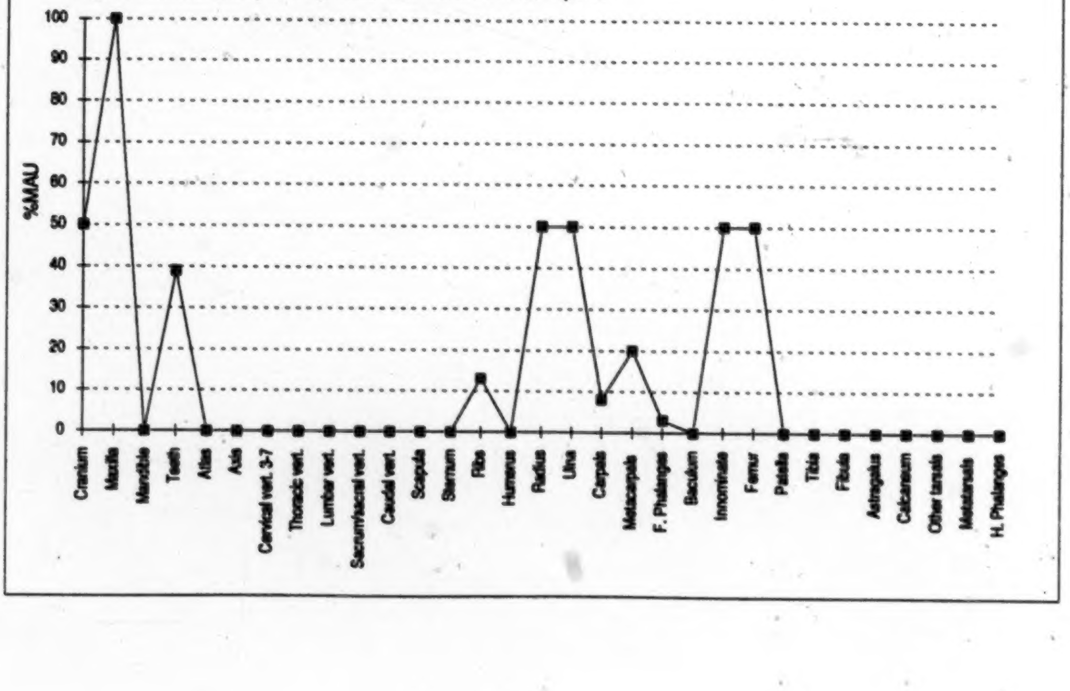


Figure 4.9 Pita site (KcFr-5): %MAU of walrus skeletal parts



families that occupied the different structures, individual bones were plotted with a special attention to the side of elements. Unfortunately, these attempts were unsuccessful. However, the map indicates that the subadult bones were only found in structure B and in caches 1 and 5. Adult bones were excavated in all but structure E.

The presence of walrus at the site is derived from the many ivory fragments recovered and hence the difference in NISP and MNE values under the "teeth" category (Figure 4.8). Other differences are found in the cranium, maxilla and ribs values. The first two are not easily broken in a walrus but if one wants to get the large canines of the animal, parts of the cranium and most certainly the maxilla have to be broken. In contrast to the bearded/large seals, the %MAU of walrus elements indicate that the head and limbs were the only parts brought back to the site. This is understandable if the most desired part of the walrus was the tusks. However, it is also possible that much of the meat and especially the blubber was first detached from the bones associated with the trunk of the animal and then carried to the site. Although it was not possible to age specific elements, it is reasonable to assume that ivory was secured from subadult or adult individuals.

Small seals

A total of 12,659 small seal bones were excavated at the Pita site. This large assemblage was divided into five age categories: foetal/newborn; juvenile; subadult; adult; and subadult or adult. The age description and criteria used for age determination are listed under Table 4.5. The total MNI is 190 individuals and the highest MNI is found among juvenile individuals. Although 55.1% of the small seal bones belong to the subadult or adult category, the total MNI for that age group is only 21 (Figure 4.10).

The MNI for foetal/newborn is four and for juvenile it is 83. Comparison between NISP and MNE values shows little differences among foetal/newborn skeletal parts (Figure 4.11). Among juvenile elements, differences between NISP and MNE values of ribs, humerus, radius, femur, tibia and fibula indicate highest fragmentation for those bones (Figure 4.12). Comparison of %MAU values between foetal/newborn and juvenile skeletal parts show that although most bones are represented among the juvenile group, this is not the case among foetal/newborn (Figure 4.13). Spatial distribution of foetal/newborn skeletal parts demonstrated that they were present in all but structure A and area E. Juvenile elements were present in all structures, albeit in only a few cases in structure A and area E.

In the subadult category, the MNI was 43 and for the adult it was 39. NISP and MNE values of subadult elements are different among the ribs, humerus, radius, ulna, femur, tibia and fibula, thus indicating highest fragmentation for these bones (Figure 4.14). Among adult bones, fragmentation is found mostly among the ribs, humerus, femur and tibia (Figure 4.15). The %MAU of subadult and adult bones show similar patterns where almost all the bones of the skeleton are represented, indicating that the seals were brought back complete from the hunting area (Figure 4.16). The only major difference is with the fused sacrum, which is absent from the subadult assemblage. This is not surprising since a subadult sacrum would not yet be fused. In contrast, unfused sacral elements are absent from the adult assemblage but present in the subadult group. Both adult and subadult groups have no cranium, scapula, innominate nor baculum. In all cases, these bones are difficult to age and if present, they were included in the "subadult or adult" category.

As mentioned above, the subadult or adult category contains mostly bones that were difficult to age but which size would easily differentiate from the foetal/newborn and juvenile bones. It is possible that some cranium fragments belonging to very young individuals were mistakenly identified as "subadult or adult." However, in the calculation of cranium MNE and MAU, only complete bullae were considered and their overall size corresponded to either subadult or adult individuals. Complete elements from the limbs are absent since they would have been identified as either subadult or adult (Table 9 in Appendices). NISP and MNE values are very different for the ribs, cranium, innominate and scapula, indicating a high degree of fragmentation for all these bones (Figure 4.17). The %MAU of the subadult or adult group shows a high representation of elements that were absent in the two previous age classes due to lack of aging criteria during the analysis. These bones are the cranium, scapula and innominate (Figure 4.18).

When all the seal bones are grouped together, all skeletal bones are represented (Table 10 in Appendices). The degree of fragmentation, as indicated by the difference between the NISP and the MNE values, is highest for the ribs, cranium, scapula, innominate, and the limb bones (Figure 4.19). The %MAU indicate that the most represented bone is the humerus (Figure 4.20). The most underrepresented bones are the carpals, baculum and sternum.

Ten small seal canines, believed to belong to ringed seals and found in the structures were cross sectioned to identify the season during which the seals were hunted. Only eight canines provided good cross-sections. The method used to "read" the dentine layers was the same as the one used by McLaren (1958) and Smith (1973) for ringed seals. The results indicate that all canines came from seals who died between April and June. This evidence, and the presence of foetal/newborn and juvenile seals, clearly indicate that the Pita site was occupied during the spring and early summer. These results are also substantiated by the presence of migratory birds such as goose.

Butchering activities

The butchering techniques used by the site inhabitants did not involve much cutting into the bones as only 0.3 % of all bones excavated showed cut marks. This result contrasts with the 11.9% bones of harbour seal from a site in Oregon analyzed by Lyman (1992). At the Pita site, most of the meat was consumed raw, boiled or dried as only 0.3% of all bones had been burnt (Table 11 in Appendices). Blubber was probably eaten raw or cooked, and was certainly preserved to be later used as oil and fuel. The low %MAU of flippers bones may indicate that the flippers were cut off the seals before they were brought back to the site. It seems more likely that they were still attached to the seals and chewed off by people or carnivores to the point of being unidentifiable. Furthermore, since the backdirt was not sieved it is possible that small elements such as carpals and tarsals were overlooked during the excavation.

Bone fragmentation

The excellent preservation of bones at the Pita site indicates that deterioration through time was not a factor in the assemblage composition. Obviously some bones, such as ribs, vertebrae and innominates, are more prone to breakage from trampling (see Davis 1987:26) and density-mediated destruction, but the high degree of bone fragmentation at the Pita site cannot be explained solely through these processes. Although recognizable marks of carnivore chewing were few (0.43% of all bones), 84.90% of all the bones showed diverse degrees of bone breakage (Table 11 in Appendices). In the case of seals, the high level of bone fragmentation of elements such as ribs, vertebrae, cranium and innominate (see Figure 4.19), suggests two things.

First, it is possible that most bone chewing did not leave diagnostic traces. Chewing was probably not the sole activity of carnivores such as wolves or polar bears. Recent experimental results by Thornton (1996) have demonstrated that small rodents gnaw on bones quite extensively without leaving diagnostic marks usually associated with rodent gnawing. Most of the bone damage in the faunal remains from the Pita site was probably caused by rodents. Also, since most of the bones were from young seals, they were certainly softer and easier to gnaw than bones from older seals.

Second, the high fragmentation of ribs and vertebrae in all age categories (Table 9 in Appendices, Figure 4.19) might correlate with the fact that the rib cage contains most of the meat and blubber in seals (Lyman et al. 1992). Thus, these elements might have been crushed during the butchering process. It is very unlikely that bone grease was rendered (see Speth and Spielmann 1983:19) through the boiling of crushed ribs and vertebrae since they appear to contain little grease at least among small seals. In the case of ribs, trampling was probably another important factor in their fragmentation.

The absence of most trunk elements in the foetal/newborn group cannot be explained by butchering activities away from the site because these small seals were easy to transport to the site. Bones of foetal/newborn are soft and they were probably chewed to the point of being unidentifiable. The high representation of humeri is likely correlated with the high bone density of this element which would make it less prone to deterioration (see Lyman 1995:56).

Another reason to account for bone fragmentation might be to extract marrow. Spiral fractures would be remnants of such activity since they are associated with the breakage of fresh bones (e.g., Johnson 1985:175). Even if spiral fractures are not exclusively produced by humans (see Lyman 1994b), it is reasonable to assume that most of those found on the bones from the Pita site were caused by people. In the Pita faunal assemblage, only 17.24% of the bones had spiral fractures (Table 11 in Appendices). This relatively low percentage of bones with spiral fractures indicates that seal bones were not valued for their marrow. Indeed, the medullary cavities of long bones from pinnipeds have low marrow content (Marean 1986:143) and are filled with trabeculated bone which prevent easy marrow extraction (Lyman et al. 1992:537).

Spatial distribution of bones

Inuit are known to divide seals into left and right portions to be distributed to sharing partners (e.g., Graburn 1969, Sandell and Sandell 1991, Van de Velde 1956). In the hope of identifying sharing patterns between families who occupied the structures, maps of major limb elements were generated for each seal age group according to side. Identified vertebrae were also mapped. The results showed no consistent patterns and the reciprocal nature of seal part sharing might have canceled out the physical evidence. There were however three exceptions. The first pattern was a high frequency of subadult left femurs near cache 5 and in the midden. This could indicate sharing of seals between two or more families. However, since no concentration of right femurs was recovered (i.e., consumed by the other family), it is not fully explained.

The second pattern was the association of metatarsals in all but structure A. Their presence in habitation structures could at first appear unusual since flippers have the lowest food value (Lyman et al. 1992) and were underrepresented in the %MAU. However, the cartilage surrounding the hind flippers is high in calcium and must be a nutritious choice, given that an almost all meat diet would be deficient in calcium. Indeed, Jenness (1922:87) indicated that the hind flippers were much esteemed for food. Guédon (1967:77) also reported that in Ivujivik, front flippers were given to women and hind flippers to men. Furthermore, metapodials and phalanges have been used by many Inuit groups in bone games (e.g., Van de Velde 1956:12; Victor and Robert-Lamblin 1989:262-268). The presence of flipper elements in habitation structures of the Pita site might be the remains of bone games.

The third pattern was a high incidence of bullae in and east of structure C. Van de Velde (1956) wrote that the head of the seal was always distributed to a sharing partner. If this was the case at the Pita site, it is difficult to understand why bullae were mostly associated with one structure when cranium fragments were found all over the site. Perhaps bullae were kept to count or remind the people how many seal were caught for future ceremonies to honour the spirit of the seals such as the bladder feast (see Fienup-Riordan 1983)? At this point, all interpretations are very speculative.

Seasonality

People occupied the Pita site mostly during the spring/early summer as indicated by the presence of bones from foetal/newborn small seals, migratory birds, and beluga whale. The inhabitants of the site may have stayed longer than the summer months as suggested by the remains of two houses with small sod walls and the presence of food caches. It seems that food was cached in pits during the spring and early summer as they contained seal bones from foetal/newborn and juvenile seals which would have been killed during these months. People could have used the cached food during their stay at the site during the spring/early summer. However, the presence of articulated vertebrae and limb bones from a single juvenile seal in cache 1 could indicate that some food was left to be consumed later, and in this particular case, was never consumed. It is likely that after caching food accumulated during the spring/early summer, people left the camp. They returned during the fall and used some of the food they had cached. Occupations of Pre-Dorset/Dorset transitional sites during both warm and cold seasons have also been reported for Groswater sites in Ungava (Gendron 1990) and Newfoundland (Renouf 1994).

The large MNI in the younger age groups clearly indicate that people hunted immature seals. The very low count of bacula suggest that few males were hunted. The target group was thus females and their pups (foetal/newborn and juvenile). It should be noted that most limb bones belonging to the juvenile category were very small and although Table 4.5 indicates that juvenile are "3-12 month old", these bones possibly belonged to the 3-5 month old. Cross-sections of seal canines from the site could confirm that age estimate.

Young seals and their lactating mothers are reported to be easy prey at least until June when most pups have been weaned (Smith 1973:21; Stirling and McEwan 1975). Ringed seals are born between mid-March and mid-April and stay in their dens during the first two months of their life (Banfield 1981:374). The identification of newborn seals in the faunal assemblages would thus indicate that the hunters took the seals from their dens. There, they could have been easily hunted by clubbing them (see also Lyman 1992, 1995). Incidentally, no complete crania were recovered at the Pita site. As for the seal mothers, the task of hunting them might have been more tricky since they would be quick to return to the sea. Furthermore, ice is dangerous for the hunters during the spring. Thus, although "stalking the basking mammals is emotionally the most satisfying hunting technique to the Inuit" (Maxwell 1985:25), it would demand great skills on the part of the hunters.

Foetal/newborn seal may have been scavenged since those born too early in the spring risk death by freezing (McLaren 1958:63). Furthermore, Inuit from northwest Québec call February, *Avunniti* ("the time when sometimes seal abort") and March, *Nassiaaliut* ("the time of newborn small seals") (Saladin d'Anglure 1967:27), reflecting the traditional knowledge on resource availability at that time of the year.

As stated above, ringed seals are usually born from mid-March to mid-April (McLaren 1958:57). The pups feed on their mother's milk for the next two months and rapidly increase in weight and blubber (Stirling and McEwan 1975:1024). Although the blubber of the lactating female is reduced during the spring (McLaren 1958:23), using the meat of the latter with the blubber of their pups and possibly rendering bone grease, might have been equivalent to hunting a female seal with normal blubber content. Thus, a three month old pup (i.e., juvenile), would be ideal prey. Finally, another attraction for pups might have been their white coat which they shed two to four weeks after birth (McLaren 1958:57). The presumably soft skin (with hair removed) of pups might also have been used to make underwear and summer clothing the same way skin from foetal/newborn caribou were used by the Inuit (e.g., Stefánsson 1919).

Adolescent seals (i.e., subadult) gradually move near the coastal areas in June (Smith 1973:21). At that time, hunters would have changed strategy and most likely hunted these subadult seals. It remains difficult to explain why only six bacula were found for an MNI of 190 seals. In effect, when subadult seals were hunted, there were as many chances to catch females as males. If most of the hunting was done in open water when hunters can look at their prey, they might have been able to distinguish females from males and thus favor female seals. It should be noted that in the spring time male seals have a "very strong, offensive, musky odour" (Banfield 1981:373) and according to Inuit informants, a very strong taste which makes them favour female seals over males. Furthermore, in the spring, male ringed seals have black fur on their face and are thus easily spotted, and thus avoided, by Inuit hunters (Saladin d'Anglure, pers. comm. 1996)

The lack of bacula is not accounted for in the manufacture of bone tools from the Ivujivik assemblages. A low incidence of bacula was also noted by Murray (1992) in her thesis on the faunal remains from a Dorset dwelling in Newfoundland. However, she too did not have an explanation. Maybe as in the case of the Ivujivik sites, hunters hunted mostly female seals. In both cases, if male seals were indeed hunted, it seems that most bacula were detached from the male seals prior to transporting them to camp.

Length of occupation

Trying to estimate how much food was available at the site is a difficult task since we do not know how long the site was occupied and how much food was obtained from the land mammals and the other sea mammals. In effect, most of the sea mammals are represented by few elements and it would be very speculative to attempt to estimate the biomass (edible meat and fat) of complete animals. The situation is different with small seals since the faunal remains indicate that whole animals were brought to the site. Using figures listed by Sandell and Sandell (1991:127) the ringed seal biomass is 26 kilograms. Sandell and Sandell (1991:129) also mention that an adult human in Greenland needs an average of one kilogram of meat per day while a child needs half a kilogram. Thus for a family of ten (five adults and five children), which is a reasonable number based on ethnohistorical sources on the Inuit of northwest Québec (see Saladin d'Anglure 1967:95), 7.5 kilograms of meat would be needed every day for the group. Thus one seal would be consumed about every four days.

Using the MNI for the small seals recovered from the Pita site, it is now possible to estimate how much seal meat was available. However, one needs first to calculate how many small seals with a biomass of 26 kilograms were at the site. To do so, the MNI of foetal/newborn and juvenile were added together and then divided by three, assuming that three seals from that age group would be equivalent to one subadult or adult seal. The total MNI was thus reduced to 116. That number was then multiplied by four since one seal would be consumed every four days. The result indicates that there was enough seals for 464 days or 15 months. Assuming that the site was occupied only for a maximum of two months per year, it would have taken 7.5 annual visits to the site to accumulate the 116 seals. This scenario is highly speculative since no other food sources were taken into account and because the actual number of people who occupied the site might have fluctuated. Nevertheless, this meat estimate for small seals corroborates the interpretation presented in Chapter 3 on how long it took to accumulate the lithic material recovered from the Pita site.

Table 4.5 Pita site (KcFr-5): Small seal distribution by age categories

Age categories	NISP	%NISP	MNI	%MNI	MAU	%MAU
Foetal/newborn	61	0.5	4	2.1	2.5	1.4
Juvenile	1832	14.5	83	43.7	69.0	37.7
Subadult	2471	19.5	43	22.6	38.5	21.0
Adult	1311	10.4	39	20.5	46.5	25.4
Subadult or adult	6984	55.1	21	11.1	26.5	14.5
All ages total	12659	100.0	190	100.0	183	100.0

Note: The MAU of subadult/adult category was calculated by adding the values of the four previous age categories and substracting them from the highest MAU of all ages combined (see Table 10 in Appendices), hence the difference with the highest MAU of Table 9 (in Appendices). The MNI of the last three categories were calculated with humeri values and accounting for the possibility that some bones might already be represented among the subadult MNI or adult MNI.

Age description:

Foetal/newborn: foetal individuals and 1-2 months old newborns
Juvenile: about 3-12 months old individuals
Subadult: yearlings and sexually immature individuals (up to about 6-7 years old)
Adult: sexually mature individuals (> 7 years old)

Age determination:

Foetal/newborn: underdeveloped morphological features, epiphyses unfused, porous cortex, bones quite smaller than those of a 3-5 months old ringed seal in comparative collection*

Juvenile: underdeveloped morphological features, epiphyses unfused, porous cortex, bones about the same size as those of a 3-5 months old ringed seal in comparative collection*

Subadult: developed morphological features, epiphyses unfused, porous cortex present only on the epiphyses, bones about the same size as those of subadult ringed seal in comparative collection*

Adult: epiphyses fully fused

* Comparative collection from the Zooarchaeology Laboratory at the University of Alberta

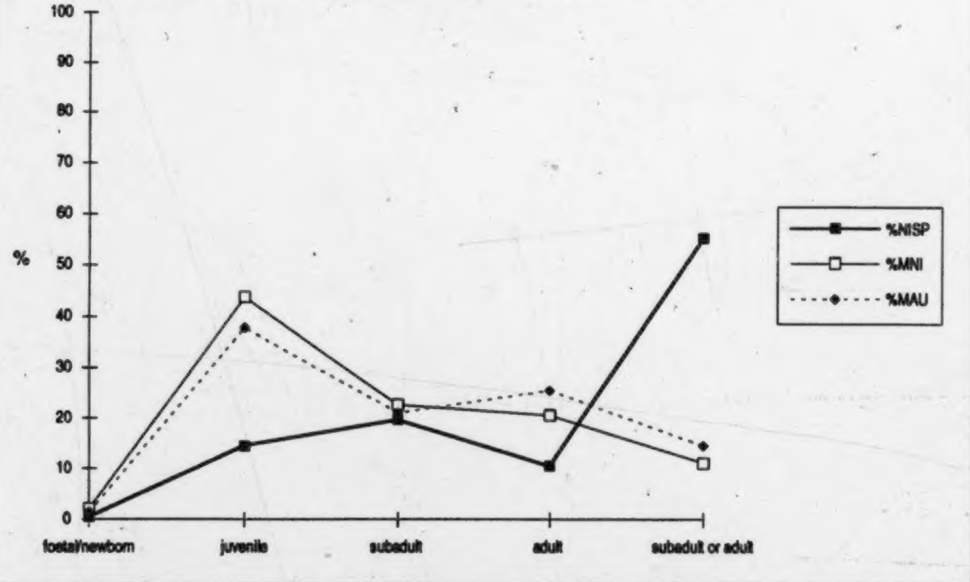


Figure 4.10 Pita site (KcFr-5): Small seal distribution by age categories

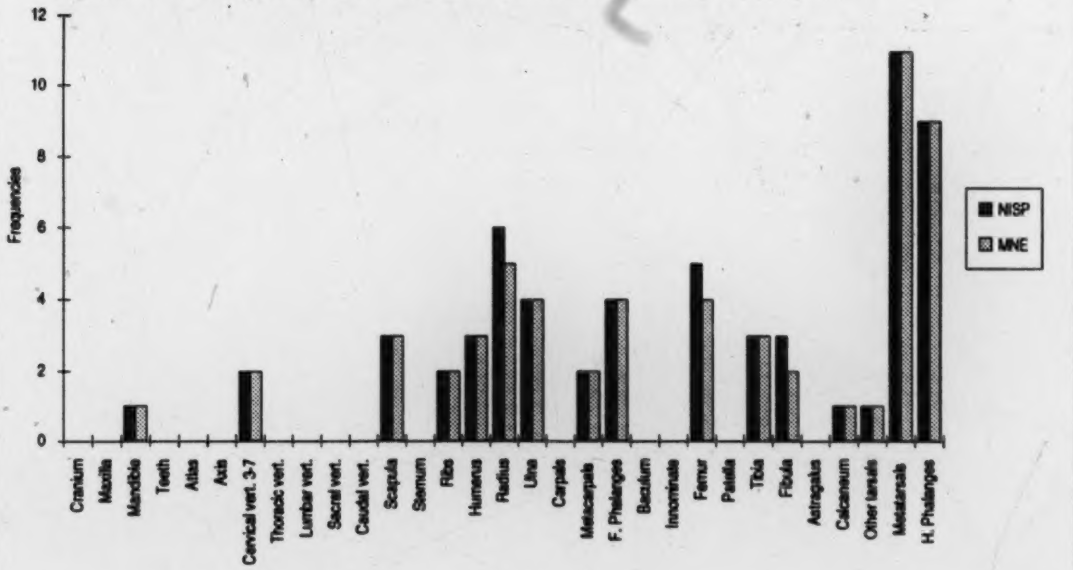


Figure 4.11 Pita site (KcFr-5): NISP and MNE of foetal/newborn small seal skeletal parts

Figure 4.12 Pita site (KcFr-5): NISP and MNE of juvenile small seal skeletal parts

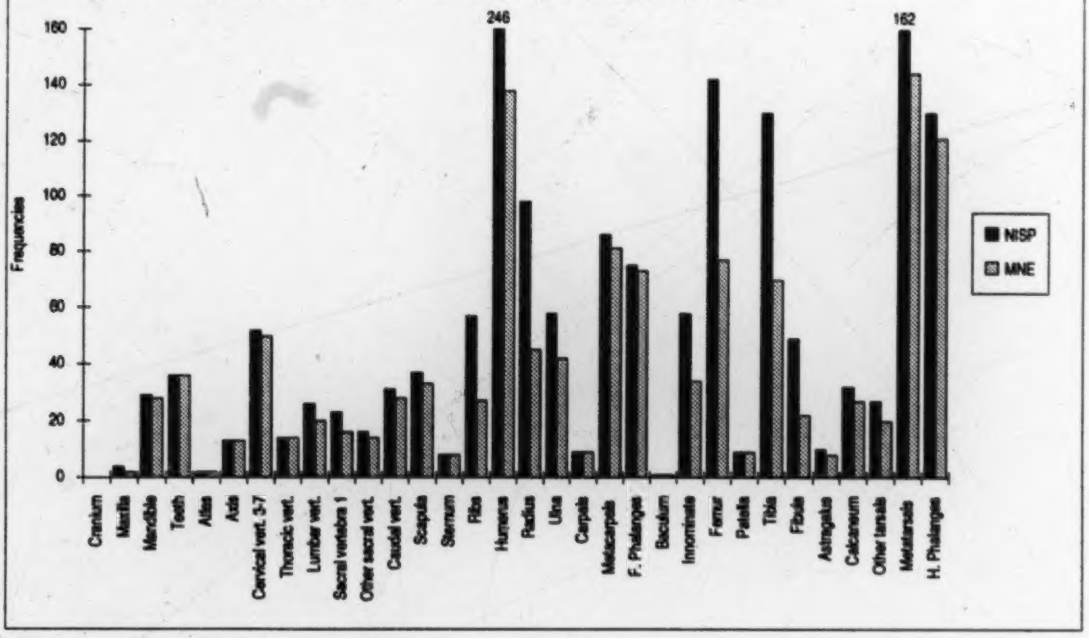
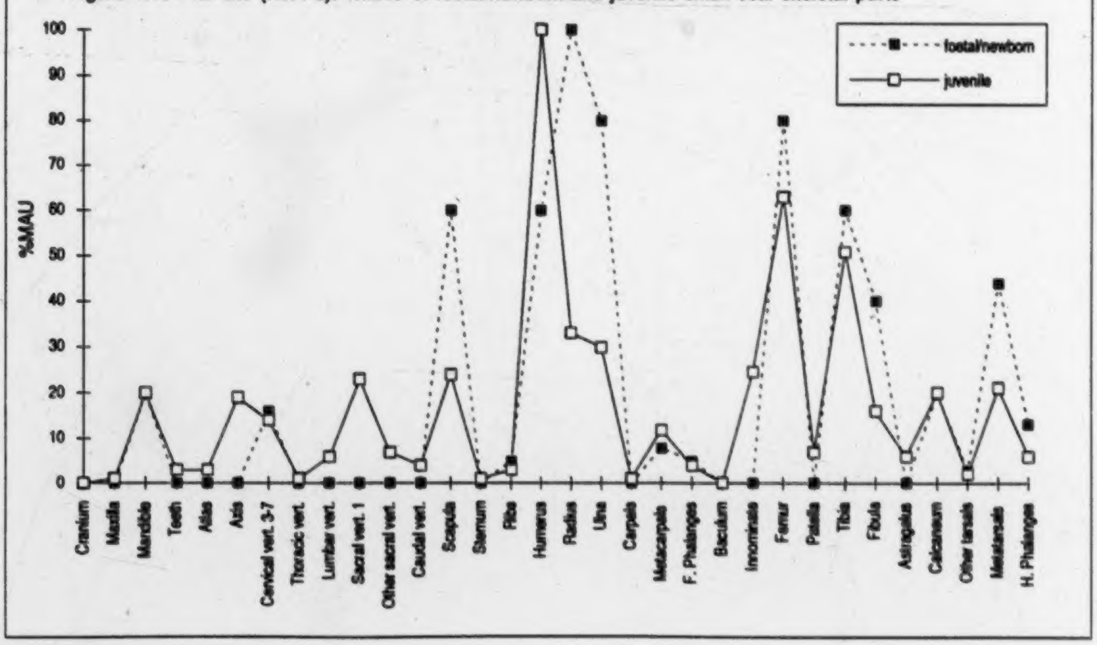


Figure 4.13 Pita site (KcFr-5): %MAU of foetal/newborn and juvenile small seal skeletal parts



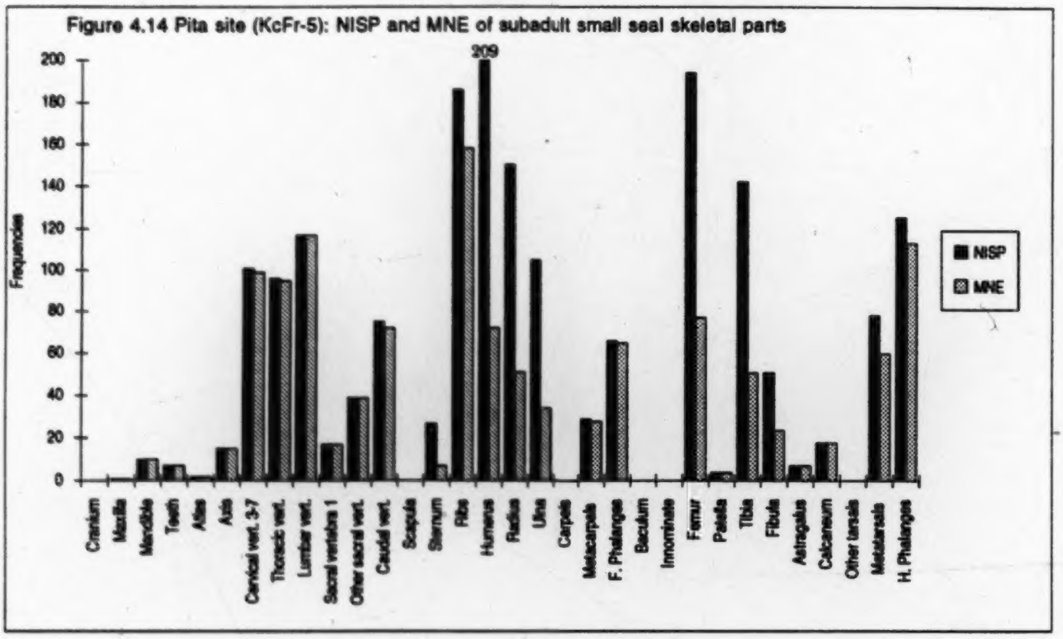


Figure 4.14 Pita site (KcFr-5): NISP and MNE of subadult small seal skeletal parts

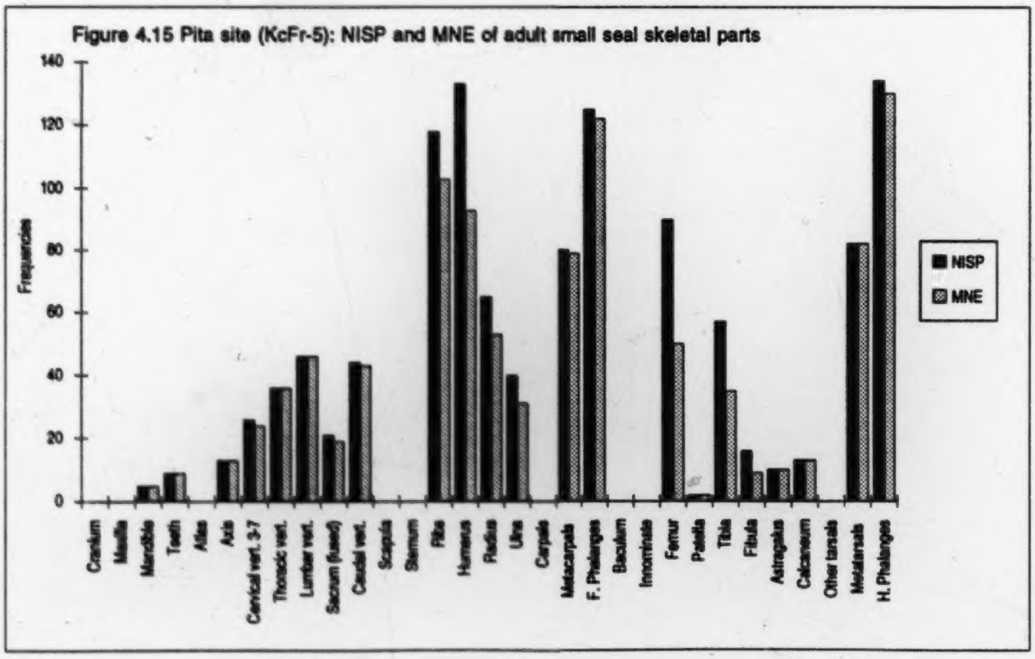


Figure 4.15 Pita site (KcFr-5): NISP and MNE of adult small seal skeletal parts

Figure 4.16 Pita site (KcFr-5): %MAU of subadult and adult small seal skeletal parts

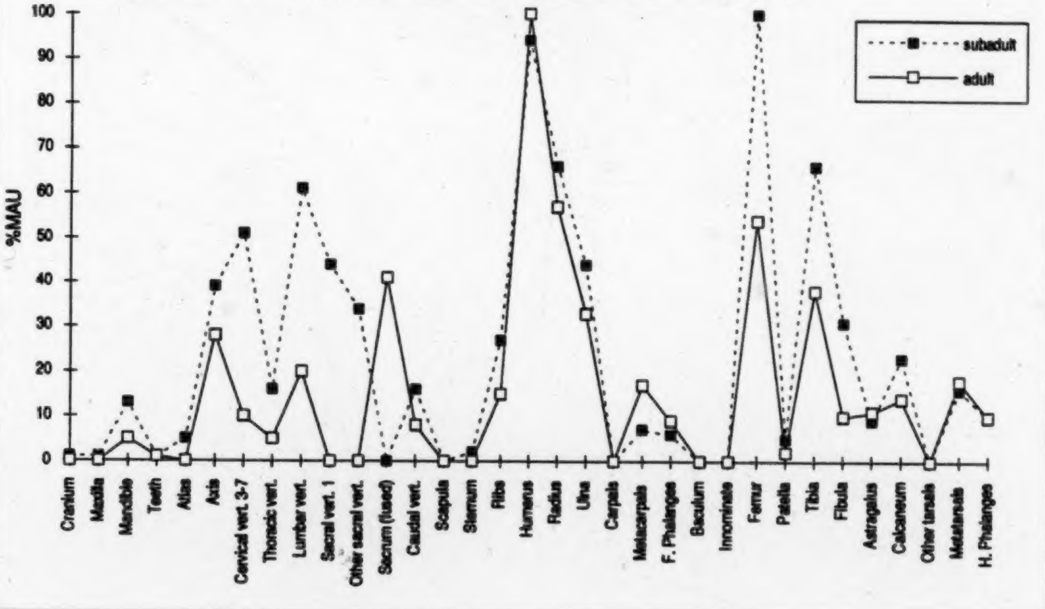


Figure 4.17 Pita site (KcFr-5): NISP and MNE of subadult or adult small seal skeletal parts

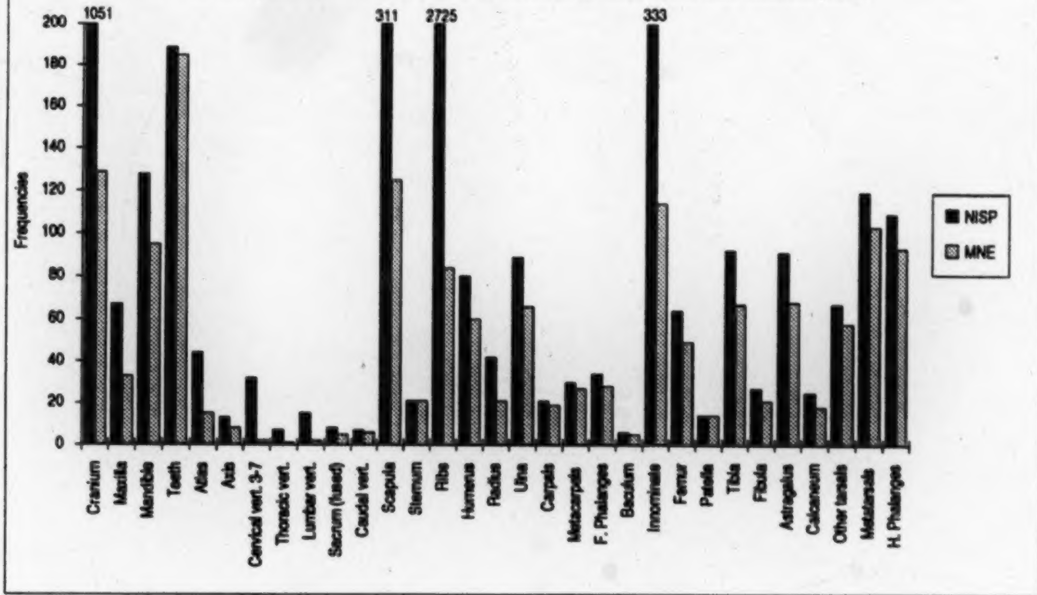
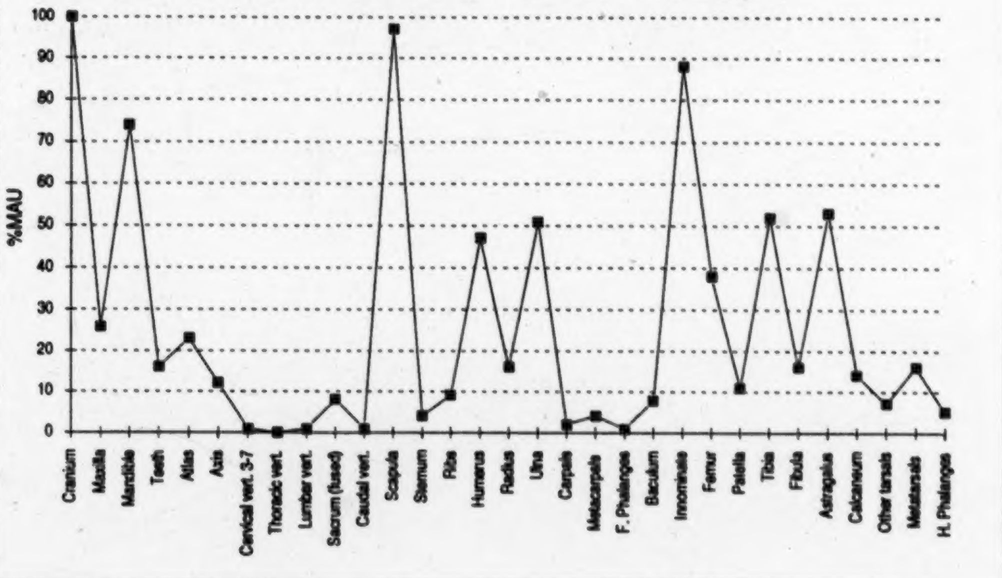


Figure 4.18 Pita site (KcFr-5): %MAU of subadult or adult small seal skeletal parts



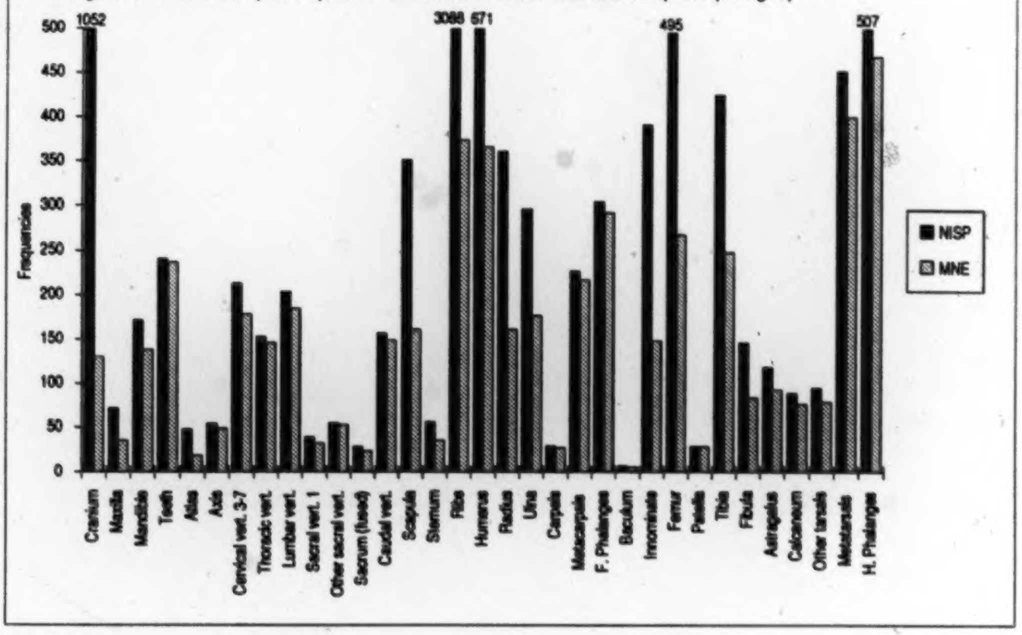


Figure 4.19 Pita site (KcFr-5): NISP and MNE of small seal skeletal parts (all ages)

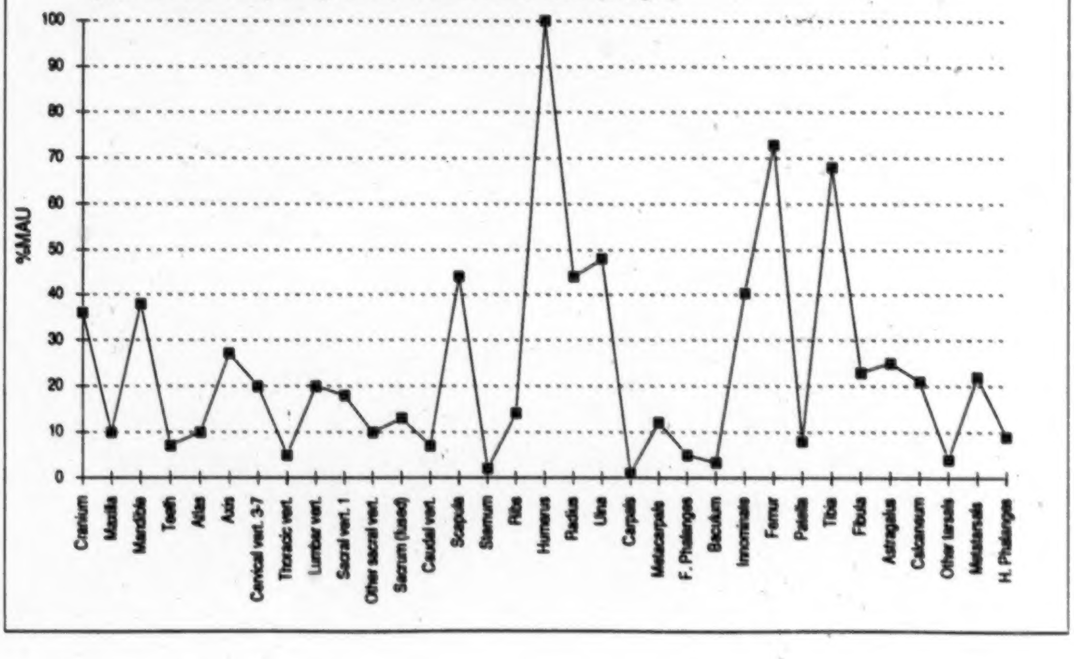


Figure 4.20 Pita site (KcF-5): %MAU of small seal skeletal (all ages)

Ohituk, area A (KcFr-3A)

Description

A total of 1,785 bones were recovered from area A of the Ohituk site (KcFr-3A). Of all the bones analyzed, 77.6% were identifiable to taxon (Table 4.6). The majority of the bones identified to taxon were sea mammals (Tables 4.8-4.9). The most common taxon was small seal (91.70 %NISP and 59.52 %MNI), and as indicated earlier, it was very likely composed almost exclusively of ringed seal.

Spatial distribution of taxa

The majority of the bones came from the southeast area (Figure 4.21). Since bones of small seal were ubiquitous at the site, the spatial distribution of the birds, land mammals and sea mammals other than small seal, was undertaken to identify possible patterns at the site. The results indicate that most of the eider or scoter bones were discarded in the southeast area while most duck (*Anas* sp.), goose and murre bones were found near the hearth feature in the centre of the site. The spatial distribution of land and sea mammal bones other than those from small seals showed no dichotomy between the centre and southeast areas of the site. The evidence reinforces the view presented in Chapter 4 that there was only one structure at KcFr-3A.

Large mammals

Although small seals are abundant at the KcFr-3A, the presence of a fair number of caribou bones needs to be considered. All other large mammals were represented by only few bones and attempts to interpret this scant data would be highly speculative. Eleven pieces of antler were recovered at the site but they are not included in Figures 4.22 and 4.23 since antler could have been procured from shed specimens. The MNI for caribou is two, with one juvenile and one adult. The aging was based on tooth usewear and apical closure, and on the degree of epiphysial fusion.

Differences between NISP and MNE values show minimal fractionation for those elements identified from the faunal assemblage (Figure 4.22). The %MAU of caribou skeletal parts indicate that the heads, some ribs and the limbs were consumed at the site (Figure 4.23). The recovery of part of the heads could suggest that almost complete animals were brought to the site. The missing elements were possibly broken to extract marrow or render grease, and were not identifiable during the faunal analysis. However, the absence of vertebrae indicates that most the trunk was not carried to the site. It seems more likely that only the limb portions, few ribs, and the heads (with possibly antler attached to the adult specimen) were brought back to the site.

Table 4.6 Ohituk site (KcFr-3A): Description of faunal assemblage

Description of bones	N	%
Identified to class only	399	22.4
Identified to taxon (order/family/genus)	1386	77.6
Total	1785	100.0

Table 4.7 Ohituk site (KcFr-3A): Description of faunal assemblage by class

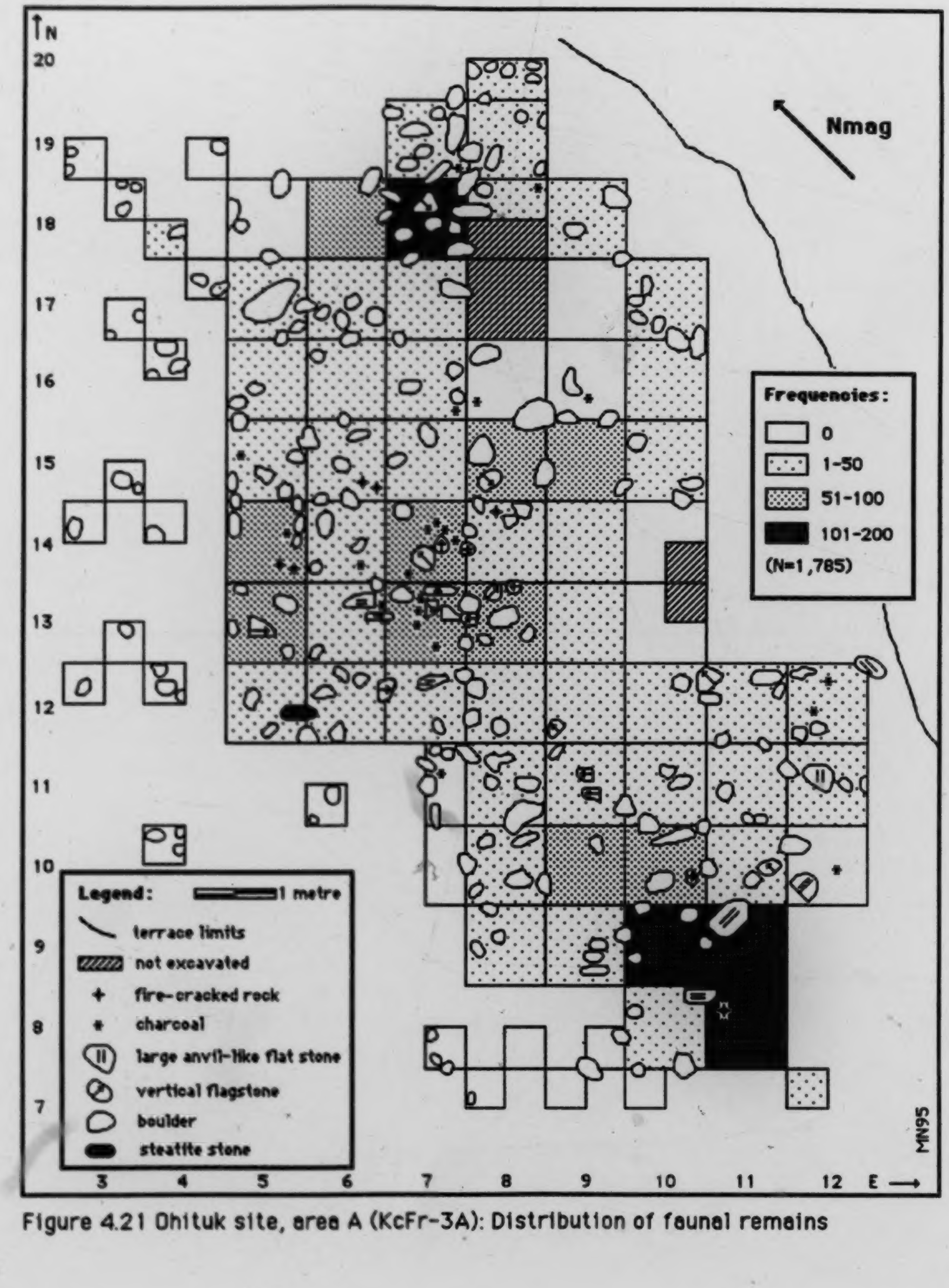
Class	N	%
Unidentified class	12	0.7
Bird	57	3.2
Mammal	1710	95.8
Mollusc	6	0.3
Total	1785	100.0

Table 4.8 Ohituk site (KcFr-3A): Description of faunal assemblage identified to taxon

Taxon	N	%
Bird	32	2.3
Land mammal	63	4.5
Sea mammal	1291	93.1
Total	1386	100.0

Table 4.9 Ohituk site (KcFr-3A): List of taxa

TAXA	NISP	%NISP	MNI	%MNI
Birds				
Anas sp.	1	0.07	1	2.38
Canada goose	3	0.22	1	2.38
Eider/scoter	17	1.23	4	9.52
Thick-billed murre	11	0.79	3	7.14
Subtotal	32	2.31	9	21.43
Land mammals				
Arctic fox	1	0.07	1	2.38
Arctic/red fox	2	0.14	–	–
Caribou	56	4.04	2	4.76
Polar bear	4	0.29	1	2.38
Subtotal	63	4.55	4	9.52
Sea mammals				
Beluga	1	0.07	1	2.38
Beluga/narwhal	4	0.29	–	–
Large whale	1	0.07	1	2.38
Bearded seal	2	0.14	1	2.38
Large seal	1	0.07	–	–
Small seal (phoca sp.)	1271	91.70	25	59.52
Walrus	11	0.79	1	2.38
Subtotal	1291	93.15	29	69.05
Total identifiable	1386	100.00	42	100.00
Unidentifiable	N	%		
Unid. class	12	3.02		
Unid. mollusc	6	1.51		
Unid. bird	25	6.28		
Unid. mammal	301	75.63		
Unid. land mammal	19	4.77		
Unid. sea mammal	36	9.05		
Subtotal	399	100.25		
Grand total	1785			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11
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E
Nmag
Frequencies:
0
1-50
51-100
101-200
(N=1,785)
Legend:
1 metre
terrace limits
not excavated
fire-cracked rock
charcoal
large anvil-like flat stone
vertical flagstone
boulder
steatite stone
MN95

Figure 4.21 Ohituk site, area A (KcFr-3A): Distribution of faunal remains

Figure 4.22 Ohituk site (KcFr-3A): NISP and MNE of caribou skeletal parts

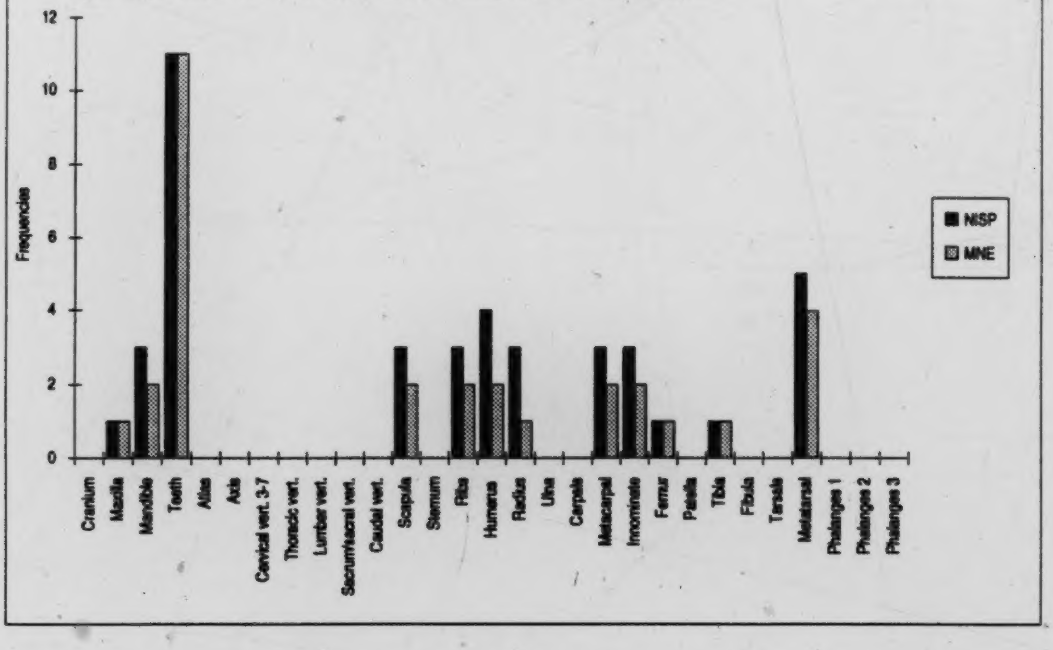
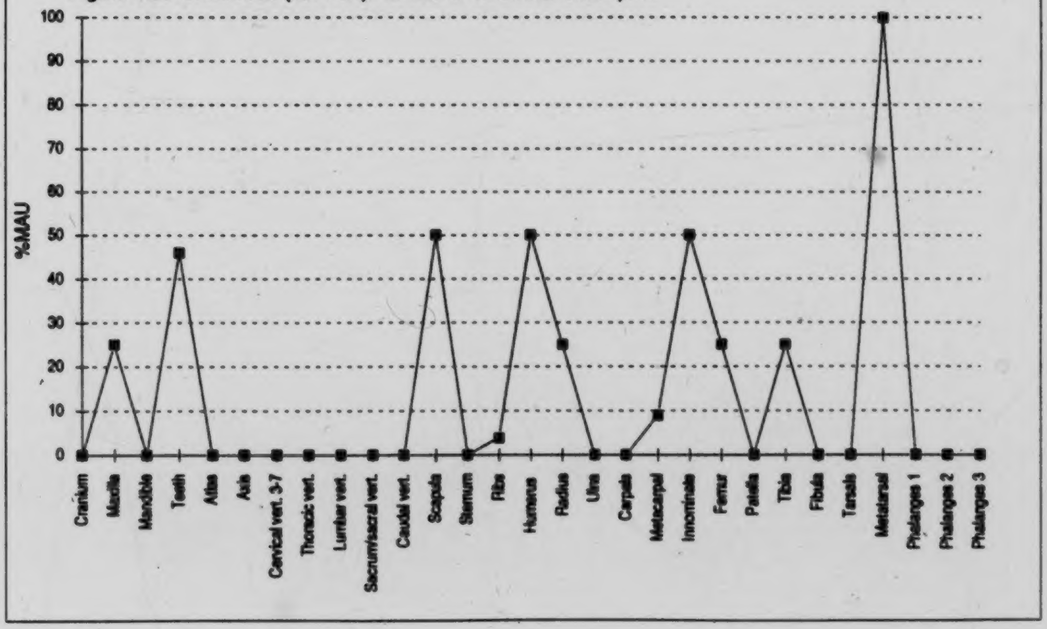


Figure 4.23 Ohituk site (KcFr-3A): %MAU of caribou skeletal parts



Small seals

A total of 1,271 bones of small seal were identified from the faunal remains of KcFr-3A, comprising five age categories: foetal/newborn, juvenile, subadult, adult, and subadult, or adult. The total MNI is 26 individuals and the highest MNI is found among juvenile individuals (Table 4.10). Although 50.7% of the small seal bones belong to the subadult or adult category, the total MNI for that age group is only one (Figure 4.24).

The MNI for foetal/newborn is one and for juvenile it is 13. Comparison between NISP and MNE values showed no differences among foetal/newborn skeletal parts. In the case of juvenile skeletal parts, differences between NISP and MNE values of humerus, tibia and fibula indicate highest fragmentation for those bones (Figure 4.25). Comparison of %MAU values between foetal/newborn and juvenile skeletal parts show that with the exception of almost all vertebrae, most bones are represented among the juvenile group. The situation is different with foetal/newborn where only hind limbs and few carpals are represented. Spatial distribution of foetal/newborn and juvenile skeletal parts demonstrated that they were present all over the site.

The MNI for subadults and adults was eight and three respectively. NISP and MNE values of subadult elements are different for the humerus, radius, femur and tibia, thus indicating a higher fragmentation for these bones (Figure 4.27). Among the adult bones, fragmentation occurs only with the femur (Figure 4.28). Comparison of %MAU between subadult and adult bones shows similar patterns where almost all the bones of the skeleton are represented, indicating that the seals were brought back complete from the hunting area (Figure 4.29). The major difference is with the lumbar and sacral vertebrae that are absent from the adult assemblage. This could mean that the trunk of the adult seal was removed or cached away from the site. Alternatively, vertebrae of adult seals might have been unidentifiable due to high fragmentation and were included in the "subadult or adult" category which indeed contained 145 unidentified vertebrae (Table 17 in Appendices). Both adult and subadult groups have no crania, scapula, innominates or bacula. These bones are difficult to age and if present, they were most certainly included in the "subadult or adult" category.

NISP and MNE values for subadult or adult elements are very different for the ribs, crania, innominates, scapula and atlas, indicating a high degree of fragmentation for these bones (Figure 4.30). The %MAU of the subadult or adult skeletal elements show a high representation of bones that were absent in the two previous age classes given the to lack of aging criteria. These bones are the cranium, innominate, atlas, scapula and axis (Figure 4.31).

With the exception of the baculum, all skeletal elements are represented when the seal bones are grouped together (Table 18 in Appendices). The degree of fragmentation, as indicated by the difference between the NISP and the MNE values, is highest for the ribs, crania, scapula, innominates, and the limb bones (Figure 4.32). The %MAU show that the most represented bones are the humerus and the femur (Figure 4.33). The most underrepresented bones are the baculum and sternum.

Butchering activities

The faunal analysis indicates that most seals were brought back as complete animals to the site. The trunk of adult seals might have been cached elsewhere. However, the low MNI (3) of this age group may have biased the frequencies of trunk elements. The butchering techniques did not involve much cutting into the bones as only 0.17 % of all the bones had cut marks. Furthermore, most of the meat and blubber was probably consumed raw or boiled as only 1.96% of all bones were burnt (Table 19 in Appendices). Spiral fractures were found on 22.07% of all bones and very likely indicate that the bones were broken when fresh. For reasons mentioned earlier, marrow extraction was probably not undertaken with seal bones. The situation was different for caribou metapodials, femurs, and humeri, which all had impact fractures reminiscent of marrow extraction.

Bone fragmentation

The condition of the faunal remains from KcFr-3A was not as good as those from the Pita site and root etching was commonly found on the bones. It is thus possible that some of the bones, and especially those of young individuals, did not preserve very well. Bad preservation might also account for the low number of flipper elements. Carnivore chewing was noted on only 0.17% of all the bones and it seems that all other undiagnostic gnawing marks (Table 19 in Appendices) are due to rodent damage (see Thornton 1996). The high fragmentation of ribs in all age categories can be explained by the fact they are associated with the most meat and blubber (Lyman et al. 1992) and could have been damaged during butchering activities. However, it is more likely that their low bone density made them easy to chew and also to break. The high representation of humerus and femur is certainly due to the high bone density of these elements which would preserve them better than most other elements (Lyman 1995:56).

Spatial distribution of bones

Maps of major limb elements were generated for each seal age group according to side in hope to notice sharing patterns between households. Identified vertebrae were also mapped. The results showed no consistent patterns.

Seasonality

As indicated by the presence of foetal/newborn and juvenile seals, juvenile caribou, and migratory birds, KcFr-3A was occupied during the spring and part of summer. The two radiocarbon dates obtained from the Ohituk site (see Chapter 3) could indicate that the site was occupied more than once. However, and as mentioned in Chapter 3, a radiocarbon date and the style of some the artifacts, link the major occupation of KcFr-3A with the transitional period, very likely during its later part. According to the second radiocarbon date, another visit to the site occurred later, briefly during the middle Dorset, but left no diagnostic artifacts. Of course, the possibility remains that the site was occupied several times and that the faunal material represents an accumulation of all these occupations. Unfortunately, no annular analysis of the caribou or seal teeth were performed because of financial restriction. However, future analyses of caribou and seal teeth could give more information about the seasons during which these animals were hunted.

As in the case of the hunting strategies used by the people who occupied the Pita site, the large MNI in the younger age groups of small seals clearly demonstrates that people from the Ohituk site also focused their hunting on immature individuals. The absence of bacula is puzzling and may once again suggest that few males were hunted while females and their pups were the main prey.

Length of occupation

Using the main assumptions and methods presented in Table 22 (in the Appendices), the small seal MNI was reduced to 17. It was then estimated that the site was occupied for a total about two months, the total being divided between two or more visits. These figures agree with the estimated length of site occupation based on the amount of lithic materials recovered and that were presented in Chapter 3. Furthermore, the absence of caches also suggest that the site was occupied for a short period.

Table 4.10 Ohituk site (KcFr-3A): Small seal distribution by age categories

Age categories	NISP	%NISP	MNI	%MNI	MAU	%MAU
Foetal/newborn	6	0.5	1	3.8	1.0	4.7
Juvenile	268	21.1	13	50.0	10.0	46.5
Subadult	311	24.5	8	30.8	8.0	37.2
Adult	41	3.2	3	11.5	2.0	9.3
Subadult or adult	645	50.7	1	3.8	0.5	2.3
All ages	1271	100.0	26	100.0	21.5	100.0

Note: The MAU of subadult/adult category was calculated by adding the values of the four previous age categories and substracting them from the highest MAU of all ages combined (see Table 18 in Appendices), hence the difference with the highest MAU of Table 17 (in Appendices). The MNI of the last three categories were calculated with humeri values and accounting for the possibility that some bones might already be represented among the subadult MNI or adult MNI.

Age description:

Foetal/newborn: foetal individuals and 1-2 months old newborns
Juvenile: about 3-12 months old individuals
Subadult: yearlings and sexually immature individuals (up to about 6-7 years old)
Adult: sexually mature individuals (> 7 years old)

Age determination:

Foetal/newborn: underdeveloped morphological features, epiphyses unfused, porous cortex, bones quite smaller than those of a 3-5 months old ringed seal in comparative collection*

Juvenile: underdeveloped morphological features, epiphyses unfused, porous cortex, bones about the same size as those of a 3-5 months old ringed seal in comparative collection*

Subadult: developed morphological features, epiphyses unfused, porous cortex present only on the epiphyses, bones about the same size as those of subadult ringed seal in comparative collection*

Adult: epiphyses fully fused

* Comparative collection from the Zooarchaeology Laboratory at the University of Alberta

Figure 4.24 Ohituk site (KcFr-3A): Small seal distribution by age categories

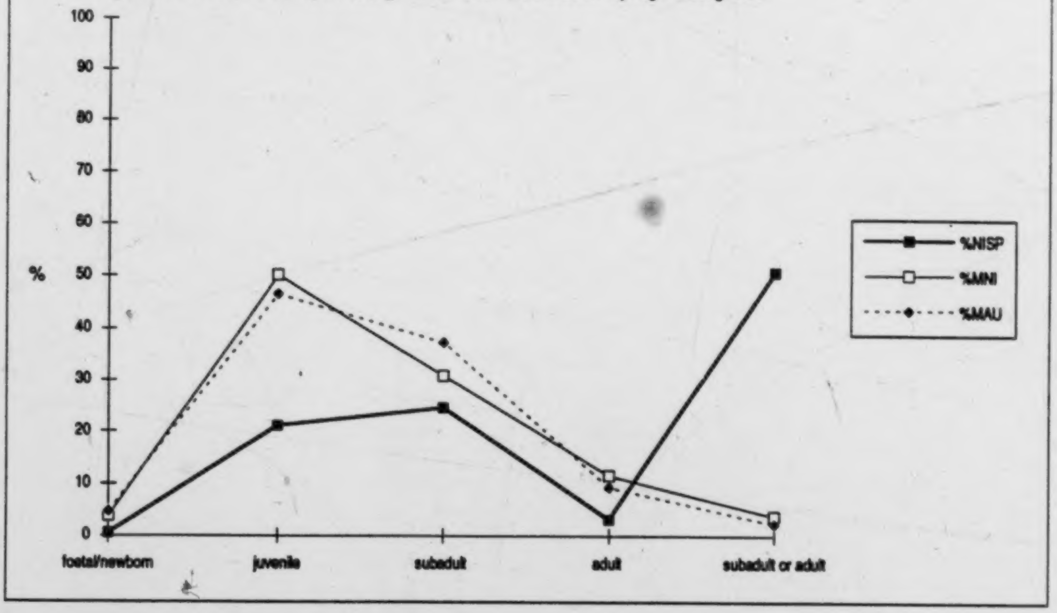


Figure 4.25 Ohituk site (KcFr-3A): NISP and MNE of juvenile small seal skeletal parts

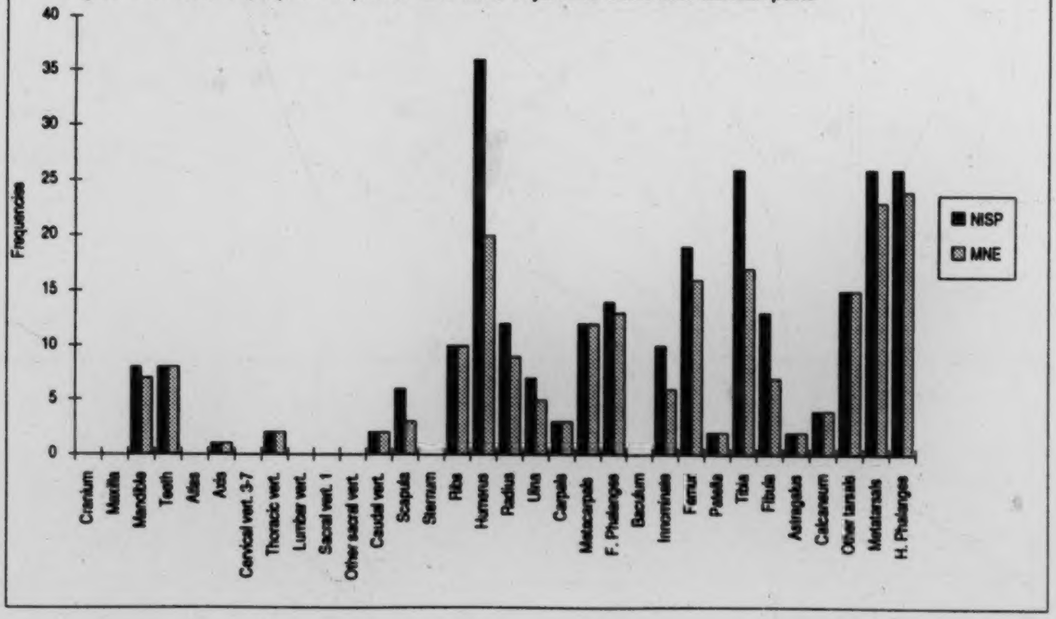


Figure 4.26 Ohituk site (KcFr-3A): %MAU of foetal/newborn and juvenile small seal skeletal parts

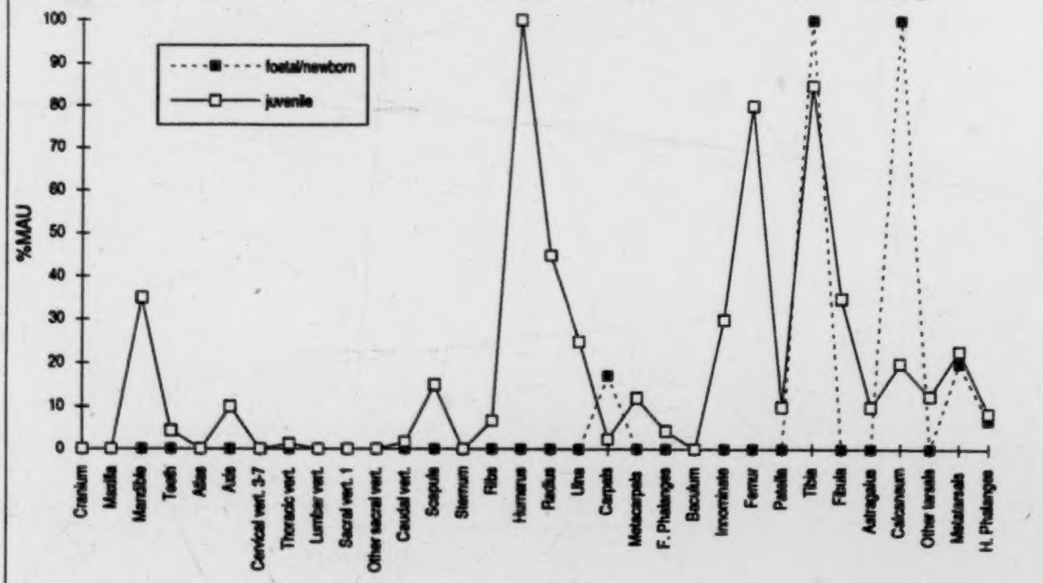
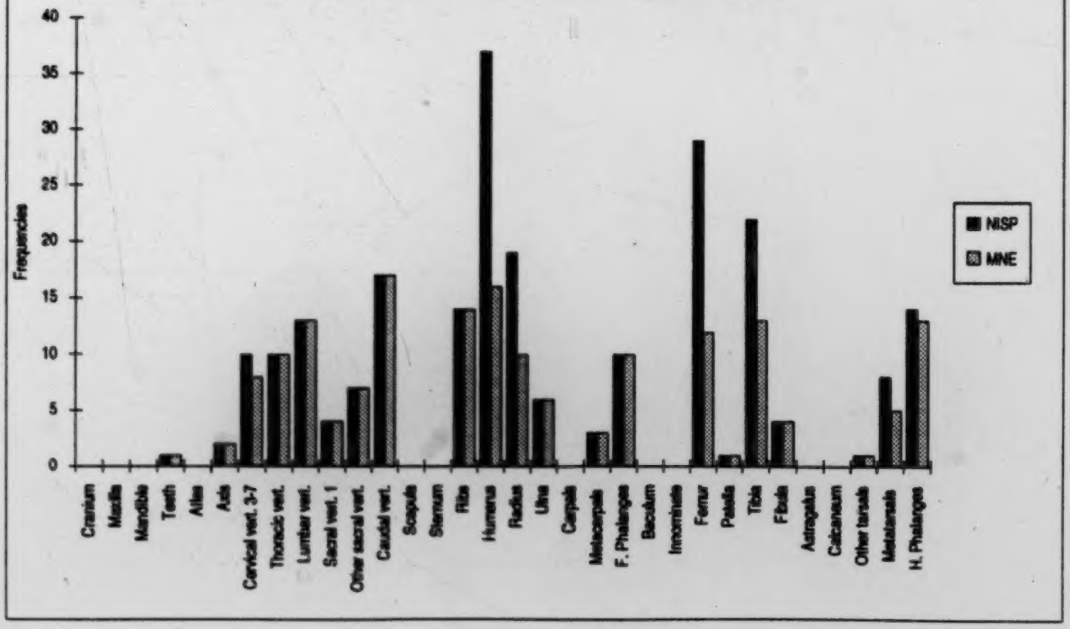


Figure 4.27 Ohituk site (KcFr-3A): NISP and MNE of subadult small seal skeletal parts



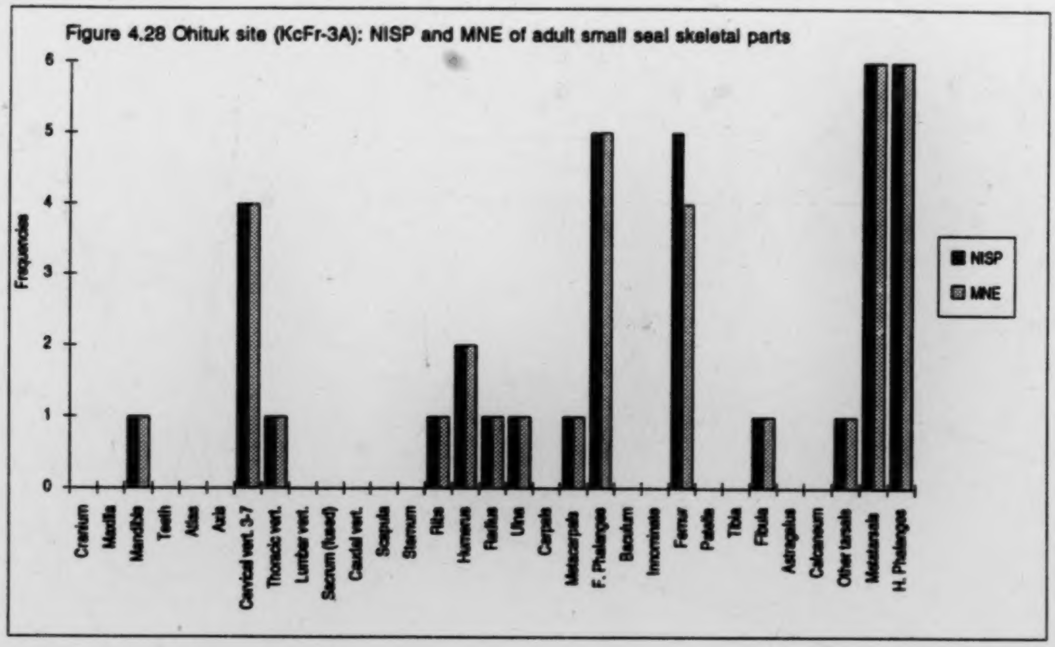


Figure 4.28 Ohituk site (KcFr-3A): NISP and MNE of adult small seal skeletal parts

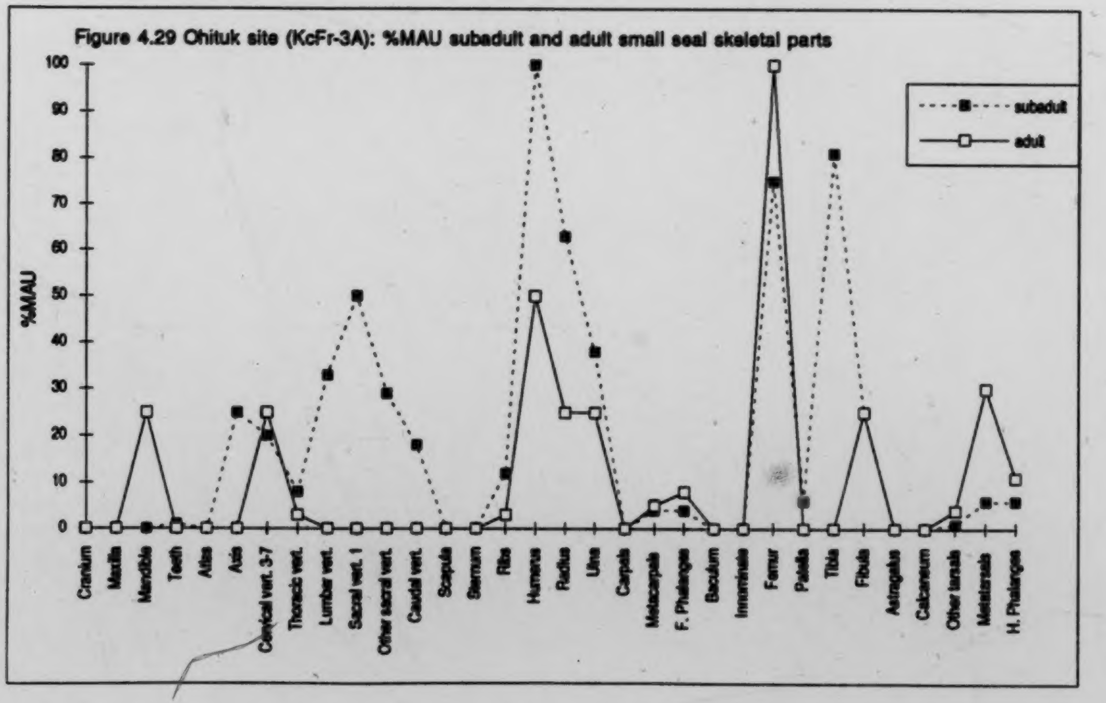


Figure 4.29 Ohituk site (KcFr-3A): %MAU subadult and adult small seal skeletal parts

Figure 4.30 Ohituk site (KcFr-3A): NISP and MNE of subadult or adult small seal skeletal parts

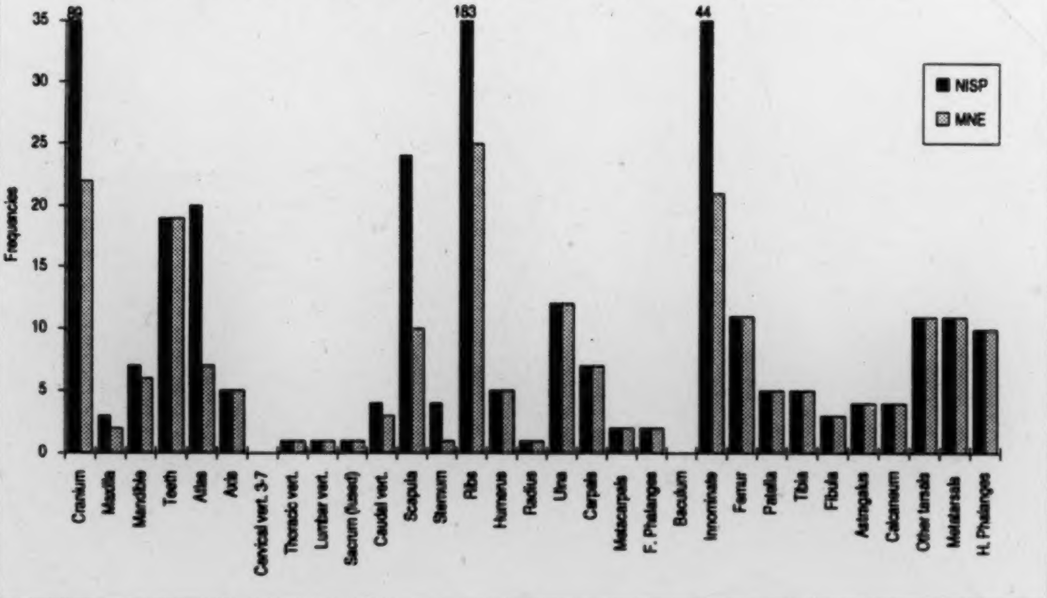


Figure 4.31 Ohituk site (KcFr-3A): %MAU of subadult or adult small seal skeletal parts

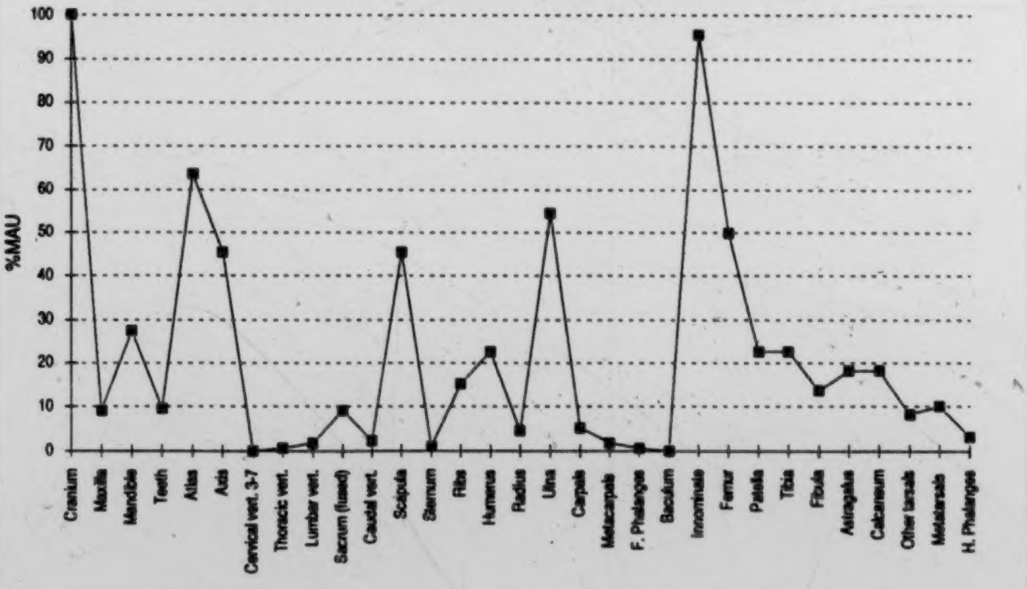


Figure 4.32 Ohituk site (KcFr-3A): NISP and MNE of small seal skeletal parts (all ages)

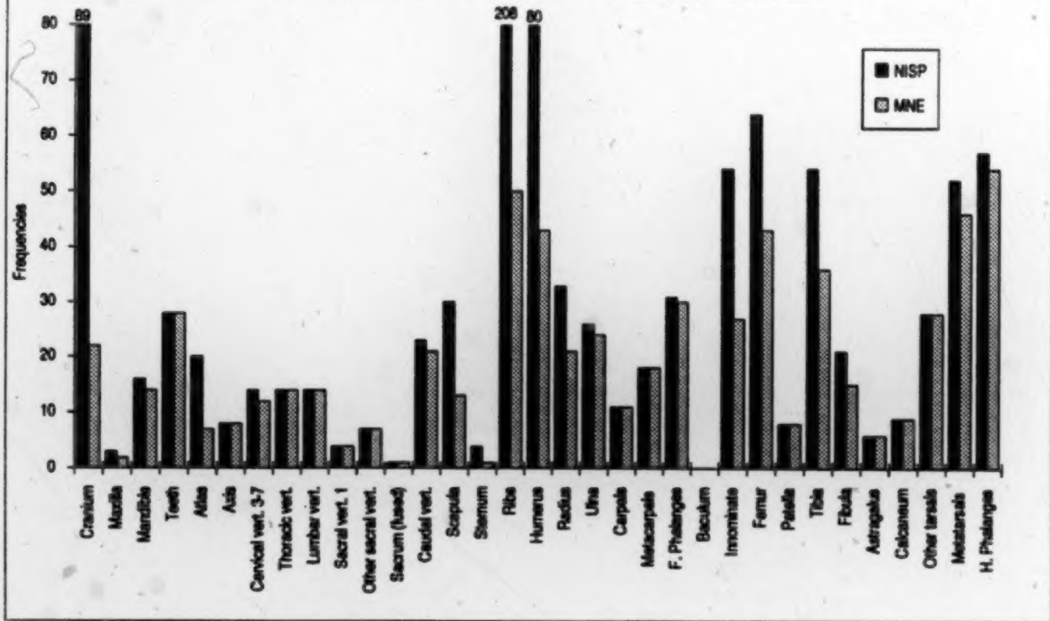
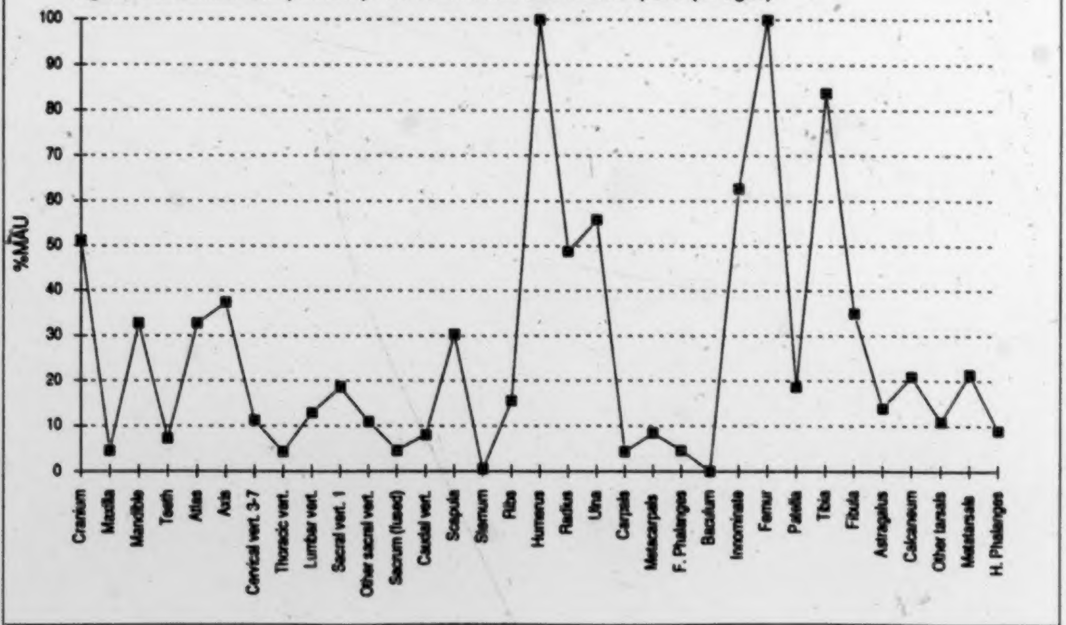


Figure 4.33 Ohituk site (KcFr-3A): %MAU of small seal skeletal parts (all ages)



Dorset site: Tivi Paningayak, area A (KcFr-8A)

Description

Area A of the Tivi Paningayak site (KcFr-8A) produced a total of 1,498 bones. Those from level 1 (N=243) were not included in the present study because of their association with a recent occupation of the site during the 1920s (Tivi Paningayak, pers. comm. 1989). Of all the 1,255 bones from level 2, 85.4% were identifiable to taxon (Table 4.11), with the majority being sea mammals (Tables 4.13-4.14). The most common taxon was small seal (95.6 %NISP and 78.9 %MNI), and was very likely composed almost exclusively of ringed seal.

Spatial distribution of taxa

The majority of the bones came from the northern edge of the site, in the midden area and in what seemed to have been a cache since it was covered by rocks (Figure 4.34). During the excavation it was surprising not to find any bone in a depression that was originally identified as a cache. The possibility remains that this feature was indeed a cache but that its content was emptied by the occupants of the site. Habitation structures had very few bones and the lowest amount was found in area F. As mentioned in Chapter 3, it is also possible that area F was not a tent but rather an area where activities linked to the production of lithic implements took place.

Since small seal bones were present in most areas of the site, the spatial distribution of land mammals and sea mammals other than small seal, was undertaken to identify possible patterns. One polar bear bone was found in structure A but all other land mammal bones were found outside the structures. The spatial distribution of sea mammals other than small seals was more informative. Bearded seal and beluga bones were found, albeit in low numbers, in all but structure F. Large whale bones were found only in structure A. This scanty information does not lead to much in the way of conclusions, except that structures A, B and K were all occupied by people relying almost exclusively on sea mammals.

Large mammals

None of the larger mammals such as caribou, polar bear, bearded seal and walrus, were present in substantial enough numbers to allow for element distribution and interpretation of hunting patterns. In fact their low bone representation suggests that these animals might have been hunted and cached elsewhere and that only some parts with meat and marrow were brought back to the site. In the case of caribou, only one worked antler fragment was recovered and since antler can be obtain from shed specimens, it is not even certain that caribou was consumed at the site.

Table 4.11 Tivi Paningayak site (KcFr-8A): Description of faunal assemblage

Description of bones	N	%
Identified to class only	183	14.6
Identified to taxon (order/family/genus)	1072	85.4
Total	1255	100.0

Table 4.12 Tivi Paningayak site (KcFr-8A): Description of faunal assemblage by class

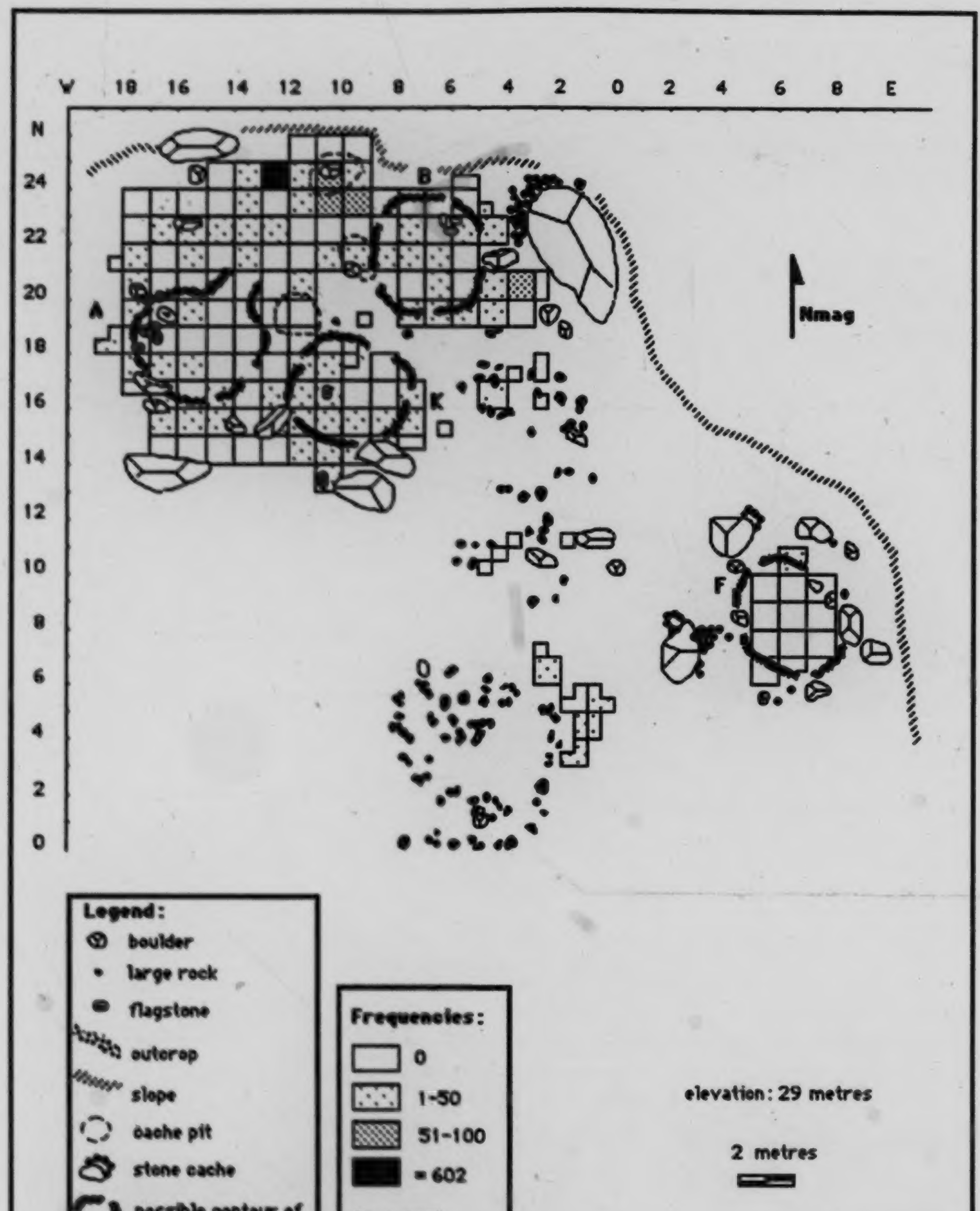
Class	N	%
Unidentified class	2	0.2
Bird	4	0.3
Mammal	1249	99.5
Total	1255	100.0

Table 4.13 Tivi Paningayak site (KcFr-8A): Description of faunal assemblage identified to taxon

Taxon	N	%
Bird	3	0.3
Land mammal	4	0.4
Sea mammal	1065	99.3
Total	1072	100.0

Table 4.14 Tivi Paningayak site (KcFr-8A): List of taxa

TAXA	NISP	%NISP	MNI	%MNI
Birds				
Thick-billed murre	3	0.3	1	2.6
Land mammals				
Arctic fox	1	0.1	1	2.6
Arctic/red fox	1	0.1	–	–
Caribou	1	0.1	1	2.6
Polar bear	1	0.1	1	2.6
Subtotal	4	0.4	3	7.9
Sea mammals				
Beluga	2	0.2	1	2.6
Beluga/narwhal	7	0.7	–	–
Large whale	6	0.6	1	2.6
Bearded seal	9	0.8	1	2.6
Large seal	3	0.3	–	–
Small seal (phoca sp.)	1025	95.6	30	78.9
Walrus	13	1.2	1	2.6
Subtotal	1065	99.3	34	89.5
Total identifiable	1072	100.0	38	100.0
Unidentifiable	N	%		
Unid. class	2	1.1		
Unid. bird	1	0.5		
Unid. mammal	106	57.9		
Unid. land mammal	1	0.5		
Unid. sea mammal	73	39.9		
Subtotal	183	100.0		
Grand total	1255			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boulder
large rock
flagstone
outcrop
slope
cache pit
stone cache
possible contour of habitation structure
Frequencies:
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1-50
51-100
= 602
(N=1,263)
elevation: 29 metres
2 metres
MN95

Figure 4.34 Tivi Paningayak site, area A (KcFr-8A): Distribution of faunal remains

Small seals

Area A of the Tivi Paningayak site yielded a total of 1,025 bones from small seals, representing five age categories which are listed in Table 4.15. The total MNI is 30 individuals and the highest MNI is found among subadult individuals. Although 41.7% of the small seal bones belong to the subadult or adult category, the total MNI for that age group is only three (Figure 4.35).

The MNI for foetal/newborns is one and for juveniles it is seven. NISP and MNE values of juvenile skeletal parts indicate that most fragmentation occurred with the humerus, radius, tibia and metatarsals (Figure 4.36). Comparison of %MAU values between foetal/newborn and juvenile skeletal parts show that although most bones are represented among the juvenile group, foetal/newborn are missing almost all elements with the exceptions of a few vertebrae and flipper bones (Figure 4.37). The low number of foetal/ newborn bones can be explained by the fact that these small bones might have deteriorated through time or were chewed by humans or carnivores to the point of being unidentifiable. The absence of sieving during the excavation could also be responsible for the loss of bones. However, since small flipper bones were identified, it is also possible that some bones were put in the juvenile category. Spatial distribution of foetal/newborn skeletal parts demonstrated that they were present in the midden and cache of the northern part of the site. Juvenile elements were present in all structures with the exception of area F and 81.5% were excavated in the midden.

In the subadult category, the MNI was 14 and for the adult it was five. NISP and MNE values of subadult elements are most pronounced among the humerus, femur and tibia, thus indicating highest fragmentation for these bones (Figure 4.38). Among adult bones, there is no difference between NISP and MNE values. The %MAU of subadult and adult bones show similar pattern only in the presence of humerus and femur (Figure 4.39). Most of the missing bones in the subadult and adult categories are found in the "subadult or adult" category (Table 24 in Appendices, Figure 4.41). Thus, most bones of the skeleton are represented with the exception of vertebrae. However, unidentified vertebrae were not included in the calculation of %MAU and it thus seems that subadult and adult seals were carried back complete from the hunting area. NISP and MNE values of subadult or adult elements show that the most fragmented bones were the ribs, innominate and scapula (Figure 4.40).

When all the seal bones are grouped together, all skeletal bones are represented (Table 25 in Appendices), with the exception of the maxillae and baculum. The degree of fragmentation, as indicated by the difference between the NISP and the MNE values, is highest for the ribs, innominates and limb bones, especially the humerus (Figure 4.42).

The %MAU indicate that the most represented bone is the humerus (Figure 4.43). The most underrepresented bones are carpals and patella, while the baculum and maxillae are totally absent.

Butchering activities

Although most of the skeletal elements of seals were recovered (Figure 4.42), the %MAU for the crania and maxillae is very low and might indicate different treatment of seal heads during the Dorset period. For example, seal heads might have been thrown back into the sea the same way beluga heads are among the Inuit from Ivujivik (Roy 1971a:153). McGhee (1981:31) also reported the lack of cranial elements from a Dorset occupation in Port Refuge (High Arctic). In contrast, data from a Dorset site in Newfoundland showed that %MAU of small seal heads were the highest (Murray 1992:92).

With the exception of the heads, which might have been discarded elsewhere near the site, complete animals were brought back to the site. The butchering techniques did not involve much cutting into the bones as only 0.3 % of all bones excavated showed cut marks. Most of the meat was consumed raw, boiled or dried as only 0.3% of all bones had been burnt (Table 26 in Appendices).

Bone fragmentation

The good preservation of bones at area A of the Tivi Paningayak site indicate that deterioration through time was not a factor in the assemblage composition. Recognizable marks of carnivore chewing represent 1.04% of all bones. Furthermore, 79.20% of all the bones showed diverse degrees of breakage (Table 26 in Appendices). With the exception of ribs, vertebrae and humeri, most bones were not fragmented. As was proposed earlier in this chapter, the high fragmentation of ribs and vertebrae is likely because of trampling and rodent damage. Spiral fractures that could be associated with marrow extraction were present in only 9.8% of all the bones. This low number demonstrates once more that seal bones were not valued for their marrow.

Spatial distribution of bones

Maps of major limb elements were generated for each seal age group according to side. Identified vertebrae were also mapped. The results showed no consistent patterns. Although spatial distribution of the bones did not allow identification of contemporaneous occupations at the site, initial doubts about the function of area F were confirmed. In effect, the low number of bones found in area F indicates that it was an open air activity area rather than a habitation structure.

Seasonality

The presence of few foetal/newborn and juvenile small seals at area A of the Tivi Paningayak site indicates that people were present during the spring and part of the summer, or that they consumed seals hunted during those seasons. The fact that lithic remains were found all around the site also suggests an occupation of the site at a season when outdoor activities were feasible. Structures B and K were thus likely occupied during spring/early summer.

The high proportion of subadult seals may be interpreted as people staying longer at the site since this age group migrates to the coast around June (Smith 1973:21). Alternatively, people could have come back in the fall to spend the winter at the site and thus hunt seals during these seasons. The absence of migratory birds, the low diversity of bird species exploited, and the presence of a subterranean house at the site, also point to a cold season occupation, at least for structure A. People who occupied that house might have lived partly on sea mammals hunted during the summer that were cached around the site.

Length of occupation

Using the assumptions and methods listed in Table 4.15, the small seal MNI was reduced to 15. It was also calculated that there were enough small seals for a two months period, or two to three occupations lasting for a few weeks. These results corroborate with the estimated length of site occupation based on the quantity of lithic material from the site that was presented in Chapter 3. Furthermore, with the exception of the midden area, the low density of bones in and around the structures also indicate that the site was occupied for a short time period. It would thus seem that the site was occupied for a few weeks in the spring and then revisited in the fall for another couple of weeks.

Table 4.15 Tivi Paningayak site (KcFr-8A): Small seal distribution by age categories

Age categories	NISP	%NISP	MNI	%MNI	MAU	%MAU
Foetal/newborn	8	0.8	1	3.3	1.0	3.5
Juvenile	356	34.7	7	23.3	8.5	29.8
Subadult	199	19.4	14	46.7	12.0	42.1
Adult	35	3.4	5	16.7	4.0	14.0
Subadult or adult	427	41.7	3	10.0	3.0	10.5
All ages	1025	100.0	30	100.0	28.5	100.0

Note: The MAU of subadult/adult category was calculated by adding the values of the four previous age categories and substracting them from the highest MAU of all ages combined (see Table 25 in Appendices), hence the difference with the highest MAU of Table 24 (in Appendices). The MNI of the last three categories were calculated with humeri values and accounting for the possibility that some bones might already be represented among the subadult MNI or adult MNI.

Age description:

Foetal/newborn: foetal individuals and 1-2 months old newborns
Juvenile: about 3-12 months old individuals
Subadult: yearlings and sexually immature individuals (up to about 6-7 years old)
Adult: sexually mature individuals (> 7 years old)

Age determination:

Foetal/newborn: underdeveloped morphological features, epiphyses unfused, porous cortex, bones quite smaller than those of a 3-5 months old ringed seal in comparative collection*

Juvenile: underdeveloped morphological features, epiphyses unfused, porous cortex, bones about the same size as those of a 3-5 months old ringed seal in comparative collection*

Subadult: developed morphological features, epiphyses unfused, porous cortex present only on the epiphyses, bones about the same size as those of subadult ringed seal in comparative collection*

Adult: epiphyses fully fused

* Comparative collection from the Zooarchaeology Laboratory at the University of Alberta

Figure 4.35 Tivi Paningayak site (KcFr-8A): Small seal distribution by age categories

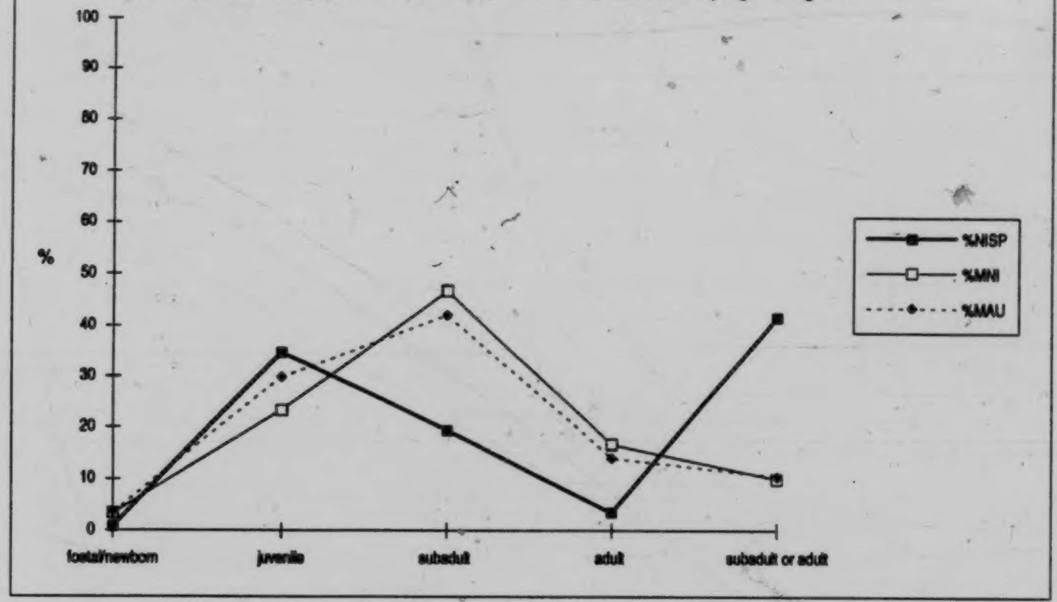


Figure 4.36 Tivi Paningayak site (KcFr-8A): NISP and MNE of juvenile small seal skeletal parts

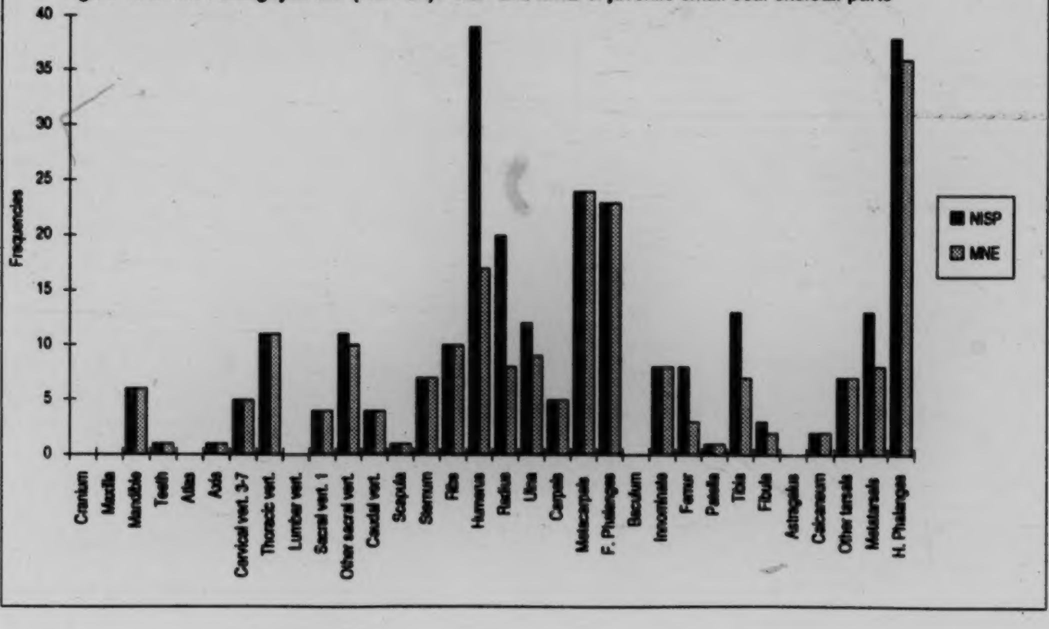


Figure 4.37 Tivi Paningayak site (KcFr-8A): %MAU of foetal/newborn and juvenile small seal skeletal parts

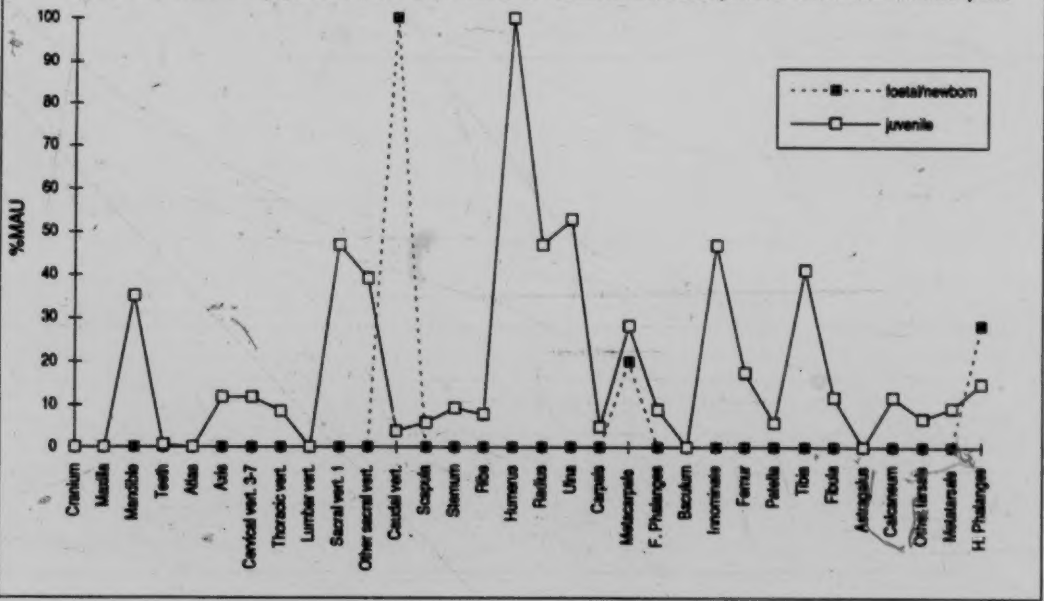


Figure 4.38 Tivi Paningayak site (KcFr-8A): NISP and MNE of subadult small seal skeletal parts

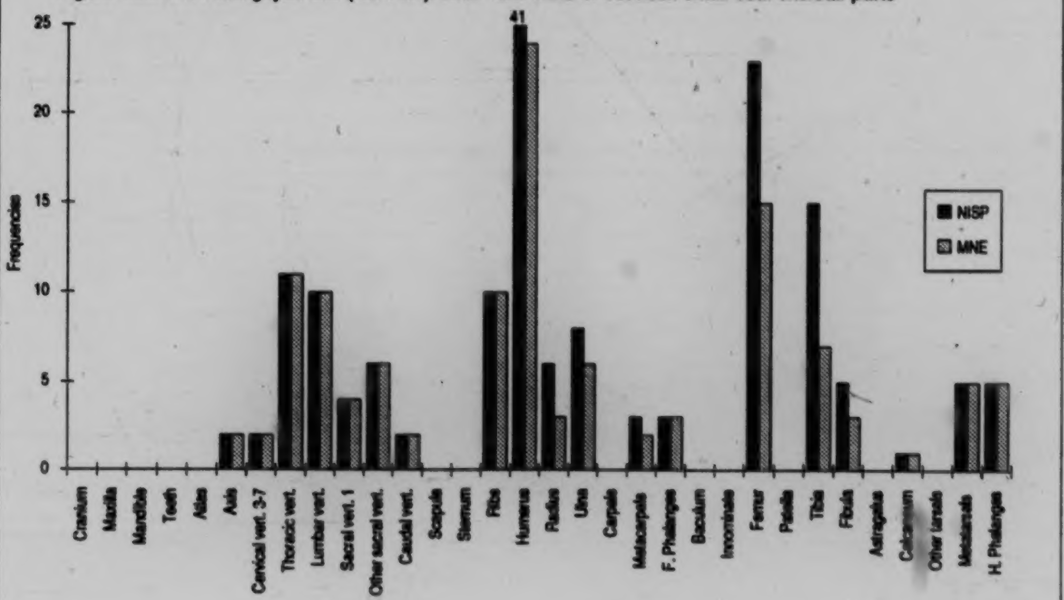


Figure 4.39 Tivi Paningayak site (KcFr-8A): %MAU of subadult and adult small seal skeletal parts

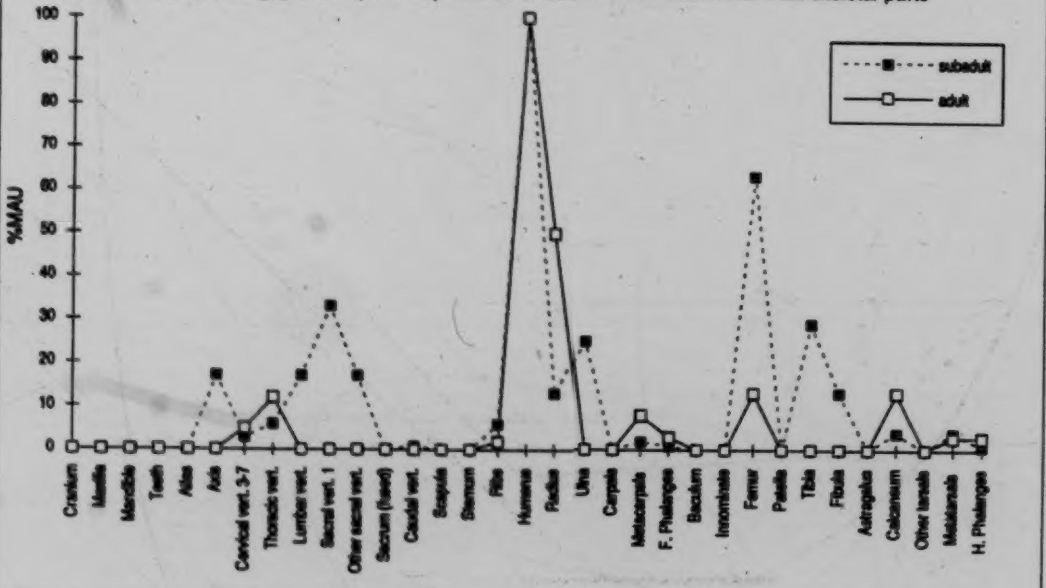


Figure 4.40 Tivi Paningayak site (KcFr-8A): NISP and MNE of subadult or adult small seal skeletal parts

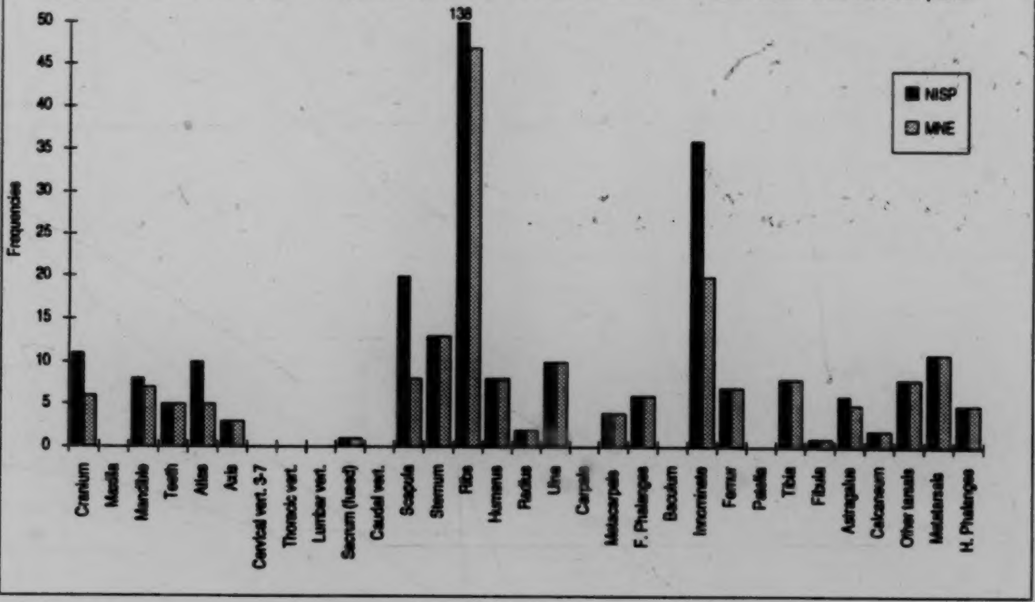
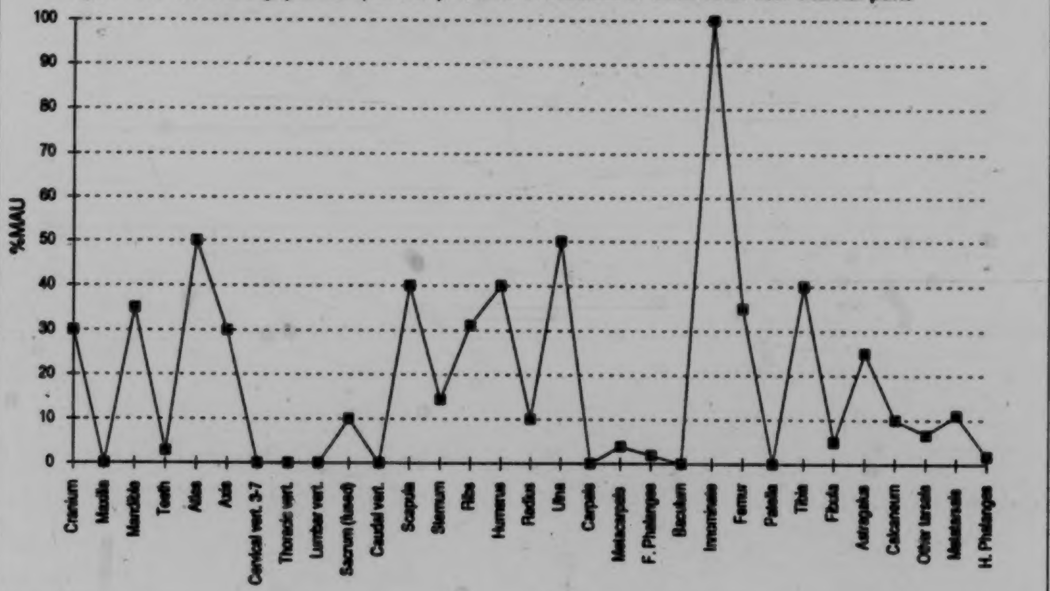


Figure 4.41 Tivi Paningayak site (KcFr-8A): %MAU of subadult or adult small seal skeletal parts



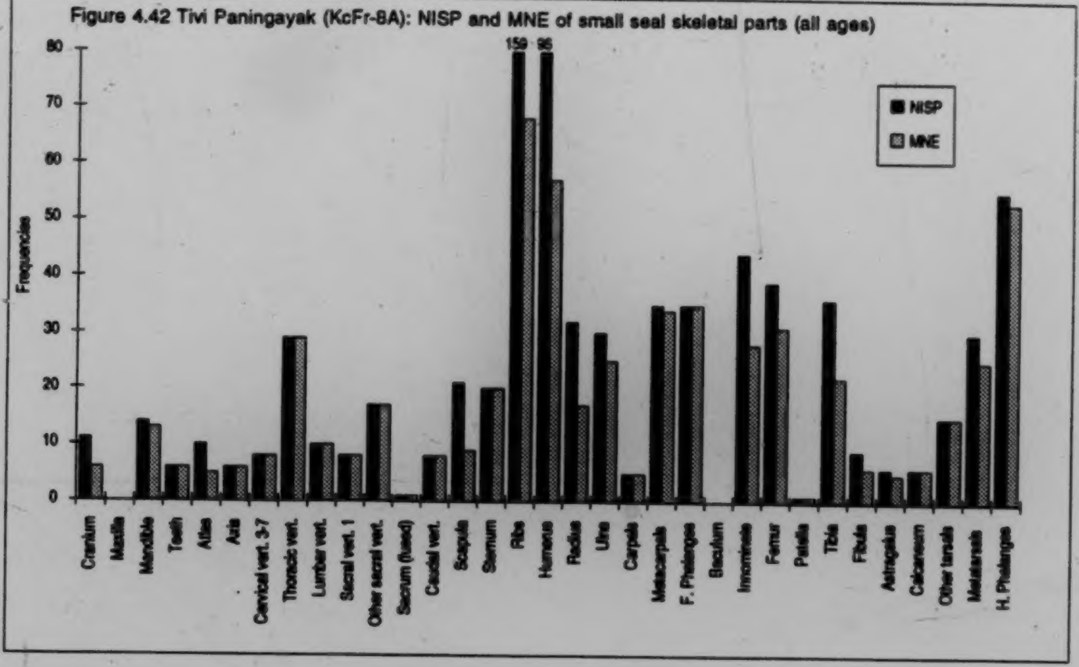


Figure 4.42 Tivi Paningayak (KcFr-8A): NISP and MNE of small seal skeletal parts (all ages)

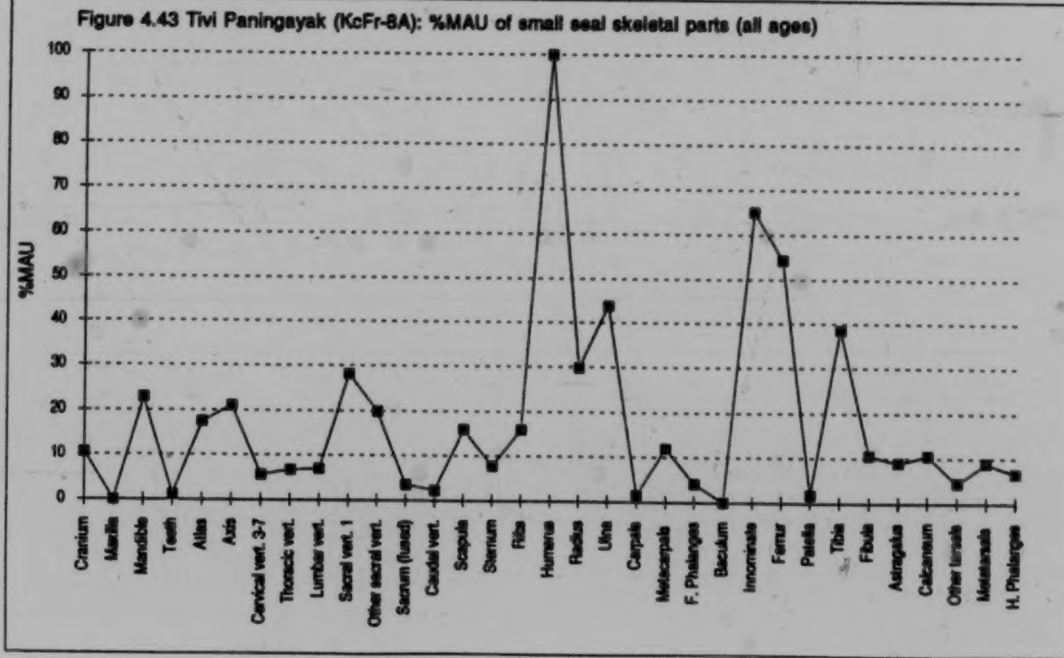


Figure 4.43 Tivi Paningayak (KcFr-8A): %MAU of small seal skeletal parts (all ages)

CHAPTER 5

Inter-site comparison to identify and understand the transition

Introduction

In the preceding two chapters, the archaeological remains were described for each site. Only intra-site comparisons were made between habitation structures and/or activity areas. These analyses and comparisons were performed to understand better the nature of the occupations within each site. For the present chapter, the results of the analyses undertaken for each of the site will be compared and interpreted. This inter-site comparison will allow the identification of similarities and differences in the way the five sites from Ivujivik were used through time. To follow up the research methods detailed in Chapter 2, the comparison will start with the settlement patterns, then the lithic technology, and finally, the subsistence patterns. The chapter concludes with a summary of the results and a discussion of the possible causes for the cultural changes that are associated with the Pre-Dorset/Dorset transition.

Settlement patterns

Habitation structures

During the Pre-Dorset period only tents, and possibly snow houses, were used as shelters in the Ivujivik sites included in this study. Rectangular houses with small sod walls appear during the early Pre-Dorset/Dorset transition and were still being used during Dorset time. These structures do not seem to have been initially dug in the ground. The only characteristic semi-subterranean house was identified at the Dorset site (KcFr-8A). These results contrast with the recent identification of semi-subterranean houses in transitional sites from Ungava (Gendron 1990) and Newfoundland (Kennett 1990; Renouf 1994).

The two rectangular houses from the early transitional site (KcFr-5) could be interpreted as prototypes of the Dorset semi-subterranean habitation or as a variation of it. Furthermore, it is possible that many of the so-called "semi-subterranean" houses reported for the Ivujivik area (Aménatech 1985) and east of the latter in the Wakeham Bay region (Barré 1970) were in fact rectangular houses with small walls rather than truly dug-in constructions. Since these habitation structures were only tested by Aménatech (1985) and Barré (1970), only additional archaeological excavations will allow better knowledge of their architecture.

As for the season of occupation of rectangular and semi-subterranean houses from Arctic sites, their more robust frame have suggested cold weather habitations. In the case of the Ivujivik sites that had rectangular and semi-subterranean structures, their association with cache pits reinforce the possibility that they were occupied during cold seasons.

However, unless evidence from faunal material supports cold season occupation, archaeologists should also consider the possibility of warm season occupation. Indeed, oral history research with Inuvialuit of the western Canadian Arctic has demonstrated that sod houses were also occupied during warmer months (see Nagy 1994c).

Since all the sites excavated for this study were located near the coast, it is difficult to properly speak about "settlement patterns" as these coastal sites represent only one component of the seasonal round. Short visits made by the author and her Inuit assistants to archaeological sites located near lakes inland on the Ivujivik peninsula, revealed an abundance of tent rings and few rectangular structures. Furthermore, more rectangular structures were identified on small islands near Ivujivik. At least some of these structures could have been used during part of the seasonal round of the people who lived during the Pre-Dorset/Dorset transition. In any case, the presence of rectangular sod houses in the early transition site and the semi-subterranean house in the Dorset site would indicate a more permanent occupation of these sites and would corroborate with a shift toward a collector adaptive strategy (see Binford 1980).

Activity areas

The spatial distribution of lithic and organic tools, and of faunal remains, allowed the identification of areas where specific activities linked to tool manufacture took place. In the two Pre-Dorset sites (KcFr-7 and KcFr-8B), flintknapping was carried on inside larger tents and in one case near the tent entrance. In the early transitional site (KcFr-5), one area which might have held a tent, was also identified as a workshop area. In the late transitional site (KcFr-3A), tool production and repairs were undertaken inside and near the entrance of a tent, while tools associated with butchering practices were found in the southeast area of the site. The Dorset site (KcFr-8A) had two areas where lithic implements were made and maintained: one was in a tent and the other in an open area, slightly away from the main habitation structures. There is thus no apparent contrast in the location of workshop areas during the different cultural periods.

Lithic technology

Raw materials

As noted in Chapter 2, one of the most drastic changes in the lithic technology from the Pre-Dorset to the Dorset period is the increase in the types of raw materials being used (e.g., Maxwell 1985). This trend is well exemplified with the archaeological materials from the Ivujivik sites (Figure 5.1). In effect, while Pre-Dorset people used chert almost exclusively to make their implements, during the Pre-Dorset/Dorset transition people started to use other materials and quartz became an important lithic source. The change to a wider range of lithic choices climaxed during the Dorset period when chert represented a little less than 50% of the lithic assemblage (Figure 5.1). Incidentally, the increase in lithic diversity in assemblages from Ivujivik during the Pre-Dorset/Dorset transition is found not only in the debitage but also in all major tool categories.

This utilization of new raw materials is probably linked to better knowledge of the area exploited. In the case of Ivujivik, quartz veins are common in the peninsula and a quarry of fine quartz crystal is located a few kilometers from the coast. Once the quartz sources were located and the quality of the material was tested, no doubt people quickly shifted to these new sources and explored others. The use of quartz might have been facilitated by the development of techniques for flaking it, possibly those linked to microblade production (Le Blanc, pers. comm. 1996). The presence of exotic quartzite, nephrite and of a few types of fine chert can be explained by trading networks (see Gendron 1990:7; Plumet 1981) or by extensive travel to their sources. Both factors were probably in operation, as Inuit are famous for their trade networks (e.g., Hickey 1979; Stefánsson 1914) and for travelling long distances (e.g., Mary-Rousselière 1980; Pitseolak and Eber 1993; Rowley 1985). This said, the possibility remains that some of these materials are not exotic but were classified as such owing to their rarity in the lithic assemblages from Ivujivik.

Major lithic tools

When the percentages of major lithic tools from all sites are compared through time, two patterns emerge (Table 5.2). The percentages were generated from the following categories of lithic tools: (1) bifaces/knives, (2) burins, (3) endblades/sideblades, (4) modified microblades, (5) retouched/utilized flakes and (6) scrapers. It should be reemphasized here that the patterns are identified by looking at the similarity in the curves (Figure 5.2) resulting from the tabulation of the percentages of major lithic tool categories (Table 5.1). Assemblages that gave the same curves, and thus similar percentages of lithic tools, are interpreted as having been produced through the same kind of activities.

The first pattern shows higher percentages of burins (26-27%), followed by endblades/sideblades (18-28%), modified microblades (13-28%) and retouched/utilized flakes (12-21%). An emphasis on the production of organic implements, very likely for hunting purposes, is suggested by the high representation of burins. The endblades/sideblades were used to hunt animals and the microblades and flakes to process their carcasses and skin. This pattern is shared by the two Pre-Dorset assemblages (KcFr-7, KcFr-8B) and by the early transitional material (KcFr-5).

The second pattern is characterized by higher percentages of modified microblades (22-44%) then endblades/sideblades (17-25%), and finally bifaces/knives (19-22%). All other tool percentages were lower than 11% and thus were not included in the list of tools associated with the second pattern. The endblades/sideblades indicate the procurement of animals and the microblades and bifaces/knives, their processing. This second pattern is found in the late transitional (KcFr-3A) and the Dorset (KcFr-8A) assemblages. The fact that burins are less represented would suggest that the hunters came to the site with most of their equipment already manufactured. The implications of this interpretation will be discussed in the next paragraphs.

Although there is a nice fit between the curves representing the two patterns in lithic tool distributions and the two major chronological periods (Pre-Dorset and early transition in one case and late transition and Dorset in the other), the major difference between the patterns is in the use of burins. The high percentages of burins it certainly linked to both the kind of activities undertaken at the sites and the season during which the sites were occupied. If Maxwell (1976, 1985) is correct in his assumption that burins were used mostly during the summer to manufacture organic implements, then the high representation of burins in Pre-Dorset and early transitional sites could also reflect summer occupations. As mentioned in Chapter 4, analyses of the faunal remains confirmed a spring/early summer season for part of the occupation at the early transitional site (KcFr-5). In the case of the two Pre-Dorset sites (KcFr-7 and KcFr-8B) which had almost no faunal remains, Maxwell's idea would suggest warm weather for at least part of the occupation.

Two other interpretations of the high percentage of burins are worth considering here. First, and as will be discussed in the section on burin technology, through time the use of spalled burins diminished and the use of burin-like tools increased. It is possible that burin-like tools were more specialized implements and had a longer life time than spalled burins because of their resharpening technique which involved mainly abrading as opposed to the removal of spalls. Thus, fewer burins at a site might mean that burin-like tools were more often used than were spalled burins. This is indeed the case at the late transition site (KcFr-3A) but not at the Dorset site (KcFr-8A).

Second, if people were using many burins in one single event or through repeated occupations, this means that they were "gearing up" (see Binford 1979) in term of organic implements for their upcoming activities. Gearing up can be done in preparation to go to a specific site or at any time, when tools are needed. In the case of the Pre-Dorset and early transitional sites of Ivujivik, the high percentages of burins suggest that people were making organic tools as they needed them. By extrapolation, it is possible that during the Pre-Dorset and early transition, people were not exploiting the territory with a specific activity in mind. Instead, they may have been hunting in an opportunistic manner what was available around them. Their behaviour was that of foragers (see Binford 1980).

However, during the later periods (i.e., late transition and Dorset), it seems that people came to chosen sites in order to carry out specific activities. In doing so, they had prepared themselves in advance and had already manufactured the major organic hunting implement they were going to use. In other words, people going to special purpose sites would only maintain and repair their toolkit at those sites, and in doing so would have needed fewer burins. This strategic use of sites and the fact that at that time people were also caching food for future use, would link their behaviour to that of collectors (see Binford 1980).

The tool percentages from the Ivujivik sites were also compared with other coastal sites in northwest Québec (Tables 5.3-5.4, Figure 5.3) and Newfoundland (Tables 5.5-5.6, Figure 5.4). These sites were selected because of their similar environmental setting to that of Ivujivik. The percentages of major tool categories from assemblages excavated by Taylor (1968) for the Pre-Dorset site Arnapik on Mansel Island and the early Dorset site Tyara near Salluit, also fit the patterns described above not only for the tools but also in term of their temporal sequence (Tables 5.3-5.4). The curves produced by the distribution of lithic tools (Figure 5.3) are extremely similar between the late transition site (KcFr-3A) in Ivujivik and the early Dorset site Tyara near Salluit, which suggests cultural continuity in the organization of activities undertaken by the people who lived during the two periods. One slight difference was found in pattern 1 for the mean percentage of modified microblades which decreases once the tools from the Arnapik site are included in the comparison (see Table 5.4). This decrease is associated with an increase in the percentage of retouched/utilized flakes. However, since these tools were very likely used during butchering, the inferences about which activities were performed at the sites remain the same.

The other assemblages used for comparative purposes were from two transitional components from the Phillip's Garden site in Port au Choix, Newfoundland (see Renouf 1994). It should also be noted that since no distinctions were made between modified and unmodified microblades in Renouf's paper (1994), the percentage of microblades for those sites represent all microblades. These percentages are thus higher than if only the modified microblades had been included.

The two assemblages from Newfoundland showed patterns similar to those associated with the late transition (KcFr-3A) and the Dorset (KcFr-8A) sites, suggesting they were probably occupied during the late transition (Figure 5.4). Indeed, radiocarbon dates of material from the Phillip's Garden East, place its occupations during that period (Renouf 1994:170). However, Renouf (1994:189) had problems with the cultural-historical position of the other site (Phillip's Garden West) since artifact styles linked it to an early transition occupation while the radiocarbon dates suggested a late transition date. If the two patterns observed between the percentages of major lithic tools can be used for chronological purposes, then Phillip's Garden West was most likely occupied during the late transition as indicated by the radiocarbon dates. In the Phillip's Garden West's assemblage, the only percentage that did not fit with either patterns was that of microblades (8%), since it was much lower than the range represented in all assemblages. This situation might be explained by the fact that Phillip's Garden West's assemblage had the highest percentage of retouched/utilized flakes (28%) which may have been used instead of microblades to process animals.

Finally, if the patterns observed in figures 5.3 and 5.4 were randomly distributed between the different time periods, they would probably reflect only the site's activities. However, their close correspondence to chronological periods demonstrates that the dichotomy in the percentages of tools indicates changes in the use of tools (and activities performed at sites) that emerged during the late transition and were fully established during the Dorset period.

Major hunting tools

In order to verify that hunting techniques had changed through time, the three Ivujivik assemblages containing the most lithic hunting implements were compared (Figure 5.5). Unfortunately, the Pre-Dorset sites (KcFr-8B and KcFr-7) did not contain enough endblades to be divided into different types. However, this fact is in itself very informative as it would suggest that the people who occupied the Pre-Dorset sites in Ivujivik did not utilize a variety of endblades to hunt. In other words, they did not have specialized hunting kits. In this regard, the absence of triangular harpoonblades (with the possible exceptions of endblades shown in Plates 3-d and 5-a) and of spearheads is revealing. In effect, if these types of endblades were associated with sea mammal hunting (see second next paragraph), then it would appear that the hunters did not pursue such activity. I should insist here that I do not mean that Pre-Dorset people had not acquired the technology to hunt seal, they certainly did (see Maxwell 1985). I am also aware that much of the sea mammal hunting technology is made from organic materials which regrettably did not survive in the Pre-Dorset sites from Ivujivik. However, if sea mammal hunting had been the focus of their activities, remains from non-perishable harpoonblades and spearheads should have been more numerous at the sites.

With the exception of the percentages of indeterminate endblades which vary from 21 to 55%, the late transitional (KcFr-3A) and Dorset (KcFr-8A) sites show similar percentages in the endblade types (arrowheads, harpoonblades, spearheads, and sideblades), once again indicating that a trend in the use of these specialized endblades started during the transition was possibly the norm during the Dorset period, at least by the people exploiting the Ivujivik area. It should be noted that arrows were found in the Dorset site (KcFr-8A), albeit in low numbers, a fact that contradicts the general assumption that the bow and arrows were not part of the Dorset toolkit (e.g., Maxwell 1985). However, the percentages of arrowheads indeed decreases from the early transition to the Dorset periods (Figure 5.5). The decrease in the use of bow and arrows must have thus emerged during the transition.

One noted difference in the distribution of the endblade types is the percentage of harpoonblades which is lower at the early transition site (KcFr-5). This observation corroborates with the extremely low number of organic harpoonheads recovered in all sites. These results are not surprising in light of the hunting strategies used by the people who occupied the Ivujivik region and particularly at the early transition site (KcFr-5). Indeed, and as indicated in Chapter 4, hunters exploited mainly newborns and juvenile seals along with their mothers during the spring season. Newborns were probably hunted in their dens. The seal mothers, who are not in their best condition at that time of the year, might have been slow to react to the sight of hunters. Actually, ring seal females are more vulnerable in May because they "spent more of their time lying out on the ice while suckling their newborns" (Smith 1973:32). Clubbing the newborn seals in their dens, and possibly their mothers while they were on the ice, may have sufficed to kill them. Also, juvenile seals are reported to be "naive and therefore more easily killed" (Smith 1973: 21). In those cases, there might have been little need for harpoons. The spearheads recovered from the Ivujivik sites might have been used to hunt seals too. At the beginning of the century, Inuit from northern Québec were indeed reported to hunt seals with spears while they were sun basking on the ice in the spring (Low 1906:153).

Furthermore, seal hunting at breathing holes was not commonly practiced by the Inuit of Kangirsujuaq (along the Québec coast, north of Ivujivik) who hunted seal almost exclusively at polynyas and at the ice floe edge (Saladin d'Anglure 1967:62). It seems that in other parts of the eastern Arctic, hunting seals at breathing holes was less often practiced since hunting at the limit of fast ice, or at tide-rips, proved more profitable (McLaren 1958: 41). This fact probably influenced the evolution of harpoon technology differently from areas where hunting at breathing holes was common practice during the winter. In the case of Ivujivik, harpoons were probably used to hunt subadult and adult seals at polynyas and along the ice floe. Some seal females still lactating were very likely harpooned too. McLaren (1958:41), for example, wrote that a few ringed seal females were "taken in the fast ice by lowering a firmly secured white-coat seal through the exit of the birth-cave, where it acts as a bait to lure the mother within striking distance of the harpoon."

Microblade technology

In Chapter 2, the classification of all microblades as tools was criticized and it was recommended that only modified microblades be included with tool classes. However, since the number of microblades increased dramatically at the late transition site (KcFr-3A) from Ivujivik (Figure 5.6), the original proposition for a new classification of unmodified microblades versus modified ones, needed to be evaluated. Thus, the percentages of all microblades (as part of the tools) was compared with the percentages of only the modified ones. It appears that in all sites, the modified microblades represented about half of all the microblades and using only their percentage values still indicate changes in their distribution through time (Figure 5.6). In the Ivujivik assemblages, all the microblades represented respectively 28% and 40% of the two Pre-Dorset occupations (KcFr-7 and KcFr-8B). They were the lowest (21%) during the early transition but they increased drastically during the late transition (56%) to be reduced again in number during the Dorset period (38%). It thus seems that although microblade technology was used during the Pre-Dorset period, in Ivujivik the trend in the increasing use of microblades can be seen only at the end of the transition period.

Measurements of width, length and thickness were taken for each microblade and these variables were tested for statistical correlations within and between sites (Nagy 1995c) but there were no significant correlations in the many tests that were performed. The only significant change through time was the use of materials other than chert, particularly quartz crystal. As mentioned earlier, similar changes had been noted for all tool categories. In the case of microblades, the increased use of quartz through time clearly indicates the preference for this high quality material to make small sharp objects such as microblades.

If, as suggested by Renouf (1994:189), microblades were used mostly to dismember sea mammals, then their relatively low number at the early transition site (KcFr-5) that contained 15 times the number of bones recovered from all the other Ivujivik sites, is difficult to explain. However, if microblades were used in the cutting of fine material such as thin animal skin (see Maxwell 1976:74), the percentages at the early transition site would be more reasonable. Alternatively, the increase in microblades during the late transition might indicate that their function changed through time and thus they became increasingly used to flense sea mammals. Finally, it seems more likely that microblades were multifunctional tools used for both activities (butchering animals and cutting skin).

Microblades percentages were compared with figures from other transitional sites to search for possible patterns. Microblade percentages from the two late transition sites of Port au Choix (Newfoundland) represented 36% of all tools at Phillip's Garden East but only 8% at Phillip's Garden West (Renouf 1994:167). The low figure from the latter site may reflect the shorter occupation of that small site. The figure from Phillip's Garden East is also rather low in comparison to the percentages from the late transitional and Dorset sites from Ivujivik.

Microblades comprised 49% of the assemblages from the transitional occupation of the JgEj-3 site in Ungava (Gendron 1990:3), which places it somewhere between the number of microblades from the late transition site and the Dorset site from Ivujivik. At Killilugak, a transitional site from Baffin Island, the microblades constituted 69% of all the lithic tools (Maxwell 1985:110), which is slightly higher than the percentage of microblades at the late transitional site Ohituk (KcFr-3A) in Ivujivik.

At the Independence II site from Port Refuge in the High Arctic, which was occupied during the transition period, microblades represented 57% of the assemblage (McGhee 1981) which is similar to the percentage of microblades recovered from the late transition site (KcFr-3A) in Ivujivik. In ten transitional sites from the High Arctic excavated by Schledermann (1990), microblades represented from 14% to 80% of the small artifact assemblages. This last percentage is much higher than any of the microblade percentages from the Ivujivik sites. This high value may indicate that for nomadic people staying during short periods of time at any one camp, microblades were ideal multipurpose tools. In fact, many could be produced from one core and little or no extra work was necessary in their manufacture before use. Also, microblade technology allows for more intensive exploitation of raw material (Orquera 1984:79) and thus their production would be less wasteful than that of flakes.

However, if other cutting tools were present at a site, fewer microblades would be needed. Sites where activities involving cutting were performed but where microblade percentages are low should thus exhibit a high representation of retouched/utilized flakes which could have been used for cutting too. This is indeed the case at the Arnapik site (Table 5.3) and at the Philip's Garden West (Table 5.5). As can be seen, the percentage of microblades in archaeological sites can be explained many ways and more comparisons with sites occupied for different length of time and for specific purpose will be needed before a comprehensive model on microblade production and use can be presented.

Burin technology

Bar graphs of the different burin types from the Ivujivik sites clearly demonstrate a high proportion of spalled burins in the Pre-Dorset and early transition periods (Figure 5.7). It is clear from the data that polished burins gradually increased in number from the early transition to the Dorset periods, indicating clearly a new trend in the burin technology. The results confirm Taylor 's (1968:82) idea that polishing techniques originated before the

Table 5.1 Comparison of the % of major lithic tool classes for all Ivujivik sites

Tool classes	Pre-Dorset	Pre-Dorset	Early Trans.	Late Trans.	Dorset
	KcFr-7	KcFr-8B	KcFr-5	KcFr-3A	KcFr-8A
bifaces, knives	10	12	12	19	22
burins	26	26	27	7	15
endblades, sideblades	28	19	18	17	25
modified microblades	16	26	13	44	22
retouched/utilized flakes	17	12	21	10	8
scrapers	2	5	10	4	8
TOTAL	100	100	100	100	100

Table 5.2 Patterns for the % of major lithic classes for all Ivujivik sites

Pattern 1:	% of tools	Mean (%)	Activities
1. burins	26-27%	26.3	gearing up
2. endblades/sideblades	18-28%	21.7	hunting
3. modified microblades	13-28%	18.3	cutting
4. retouched/utilized flakes	12-21%	16.7	cutting

Sites with pattern 1:
KcFr-7, KcFr-8B (Pre-Dorset)
and KcFr-5 (Early Transition)

Pattern 2:	% of tools	Mean (%)	Activities
1. modified microblades	22-44%	33.0	cutting
2. endblades/sideblades	17-25%	21.0	hunting
3. bifaces/knives	19-22%	20.5	butchering

Sites with pattern 2:
KcFr-3A (Late Transition)
and KcFr-8A (Dorset)

Figure 5.1 Lithic raw materials from Ivujivik sites

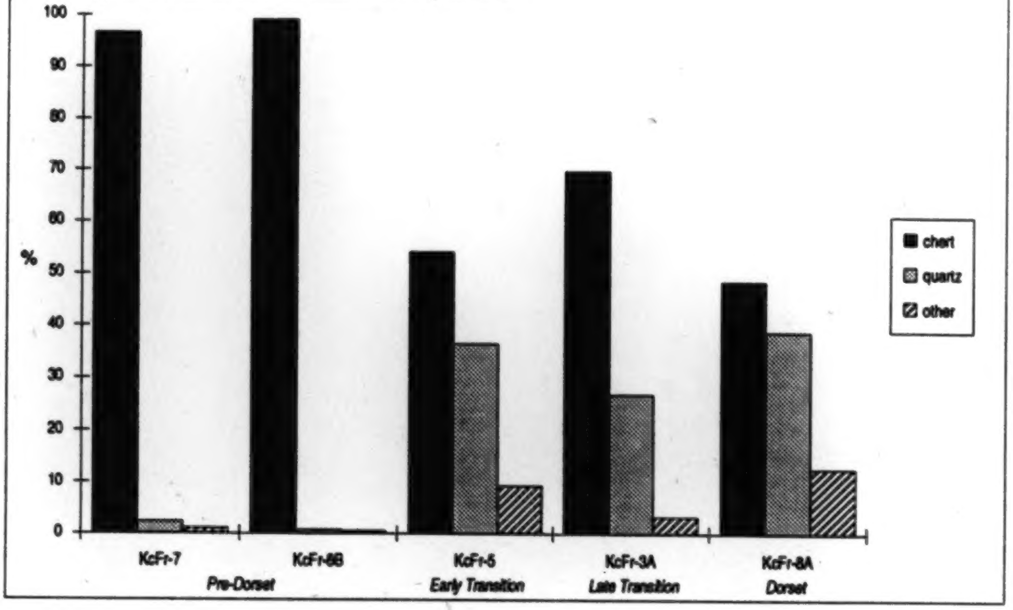


Figure 5.2 Major lithic tools from Ivujivik sites

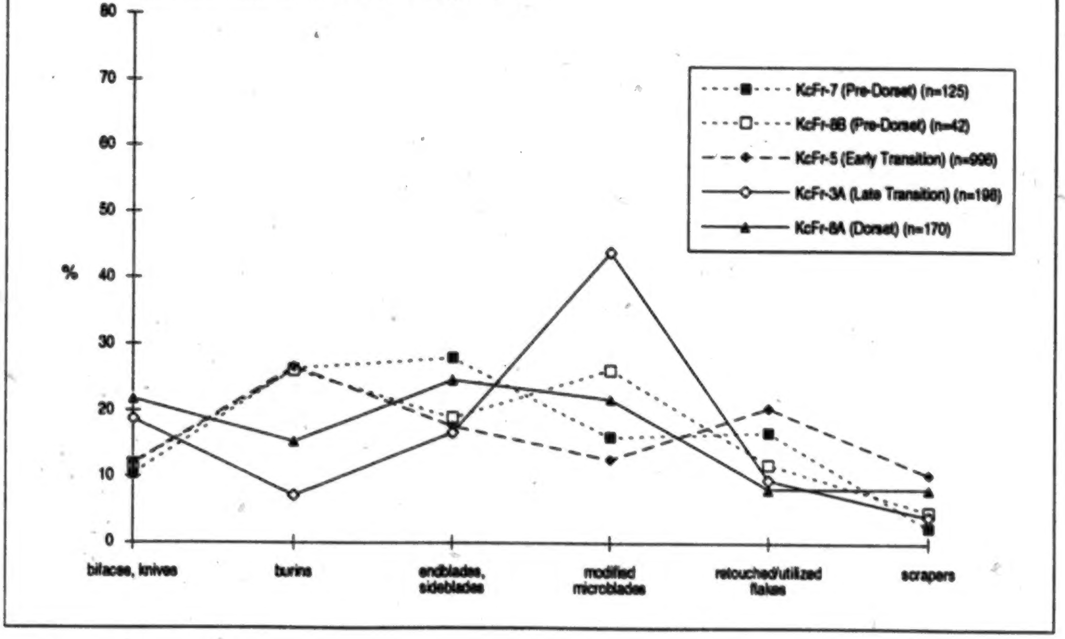


Table 5.3 Major lithic tools percentages from northwest Québec Palaeoeskimo sites

Tool classes	Pre-Dorset	Pre-Dorset	Pre-Dorset	Early Trans.	Late Trans.	Early Dorset	Dorset
	Arnapik	KcFr-7	KcFr-8B	KcFr-5	KcFr-3A	Tyara	KcFr-8A
bifaces, knives	3	10	12	12	19	26	22
burins	26	26	26	27	7	2	15
endblades, sideblades	27	28	19	18	17	19	25
modified microblades	2	16	26	13	44	37	22
retouched/utilized flakes	34	17	12	21	10	8	8
scrapers	8	2	5	10	4	9	8
TOTAL	100	100	100	100	100	100	100

Table 5.4 Patterns of major lithic tool classes for northwest Québec Palaeoeskimo sites

Pattern 1:	% of tools	Mean (%)	Activities
1. burins	26-27%	26.3	gearing up
2. endblades/sideblades	18-28%	23.0	hunting
3. retouched/utilized flakes	12-34%	21.0	cutting
4. modified microblades	2-26%	14.3	cutting

Sites with pattern 1:
Arnapik, KcFr-7, KcFr-8B (Pre-Dorset),
KcFr-5 (Early Transition)

Pattern 2:	% of tools	Mean (%)	Activities
1. modified microblades	22-44%	34.3	cutting
2. bifaces/knives	19-22%	22.3	butchering
3. endblades/sideblades	17-25%	20.3	hunting

Sites with pattern 2:
KcFr-3A (Late Transition),
Tyara (Early Dorset), KcFr-8A (Dorset)

Table 5.5 Major lithic tools percentages from Ivujivik and Newfoundland Palaeoeskimo sites

Tool classes	Pre-Dorset	Pre-Dorset	Early Trans.	Transition	Transition	Late Trans.	Dorset
	KcFr-7	KcFr-8B	KcFr-5	P. G. West	P. G. East	KcFr-3A	KcFr-8A
bifaces, knives	10	12	12	35	21	19	22
burins	26	26	27	3	3	7	15
endblades, sideblades	28	19	18	18	14	17	25
modified microblades	16	26	13	8	36	44	22
retouched/utilized flakes	17	12	21	28	16	10	8
scrapers	2	5	10	8	10	4	8
TOTAL	100	100	100	100	100	100	100

Table 5.6 Patterns of major lithic tool classes for Ivujivik and Newfoundland Palaeoeskimo sites

Pattern 1:	% of tools	Mean (%)	Activities
1. burins	26-27%	26.3	gearing up
2. endblades/sideblades	18-28%	21.7	hunting
3. modified microblades	13-26%	18.3	cutting
4. retouched/utilized flakes	12-21%	16.7	cutting

Sites with pattern 1:
KcFr-7 and KcFr-8B (Pre-Dorset),
KcFr-5 (Early Transition)

Pattern 2:	% of tools	Mean (%)	Activities
1. modified microblades	8-44%	27.5	cutting
2. bifaces/knives	21-35%	24.3	butchering
3. endblades/sideblades	14-25%	18.5	hunting

Sites with pattern 2:
P. G. West and P. G. East (Transition),
KcFr-3A (Late Trans.), KcFr-8A (Dorset)

Figure 5.3 Major lithic tools from northwest Québec Palaeoeskimo sites

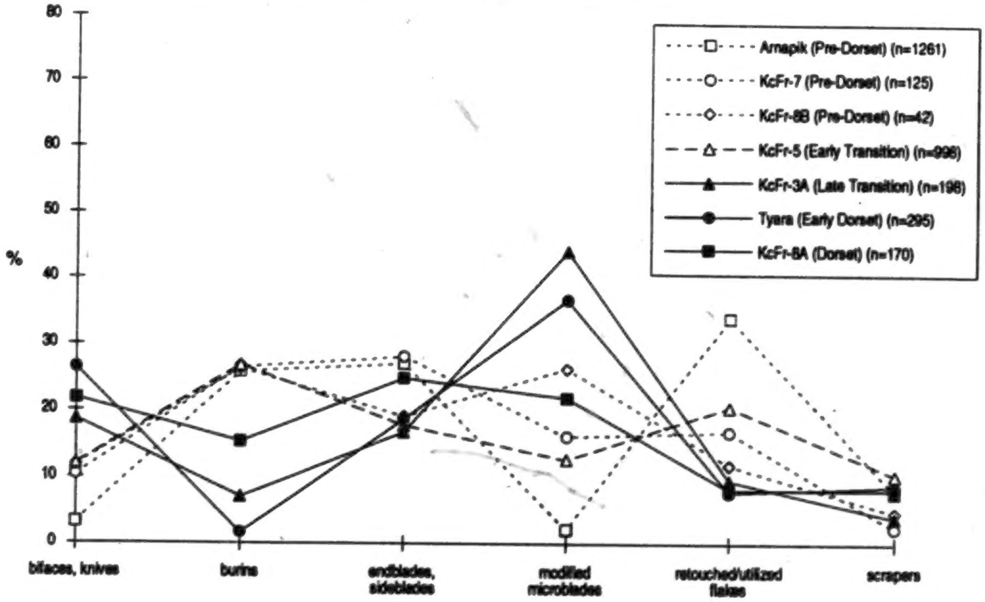


Figure 5.4 Major lithic tools from Ivujivik and Newfoundland Palaeoeskimo sites

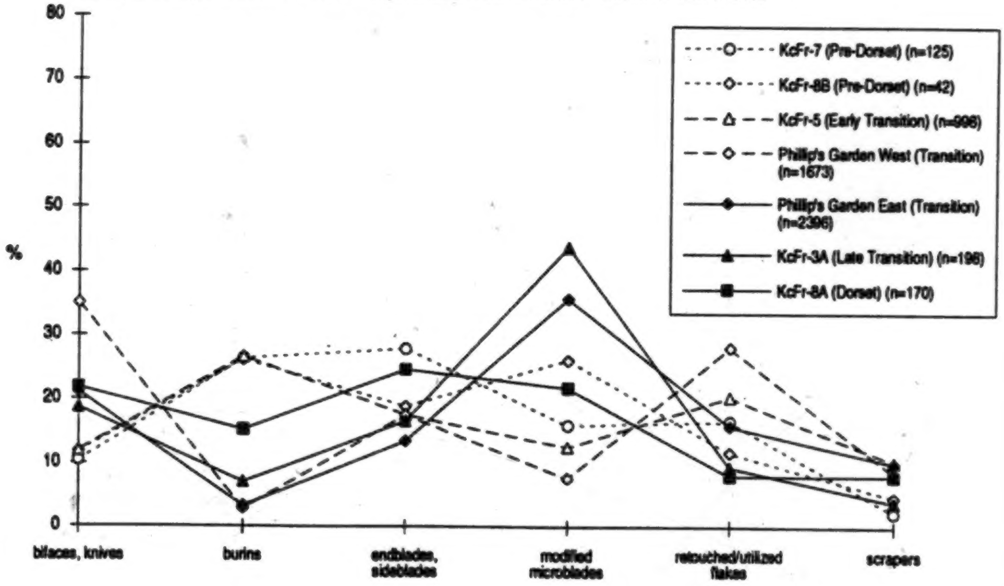


Figure 5.5 Major hunting tools from Ivujivik sites

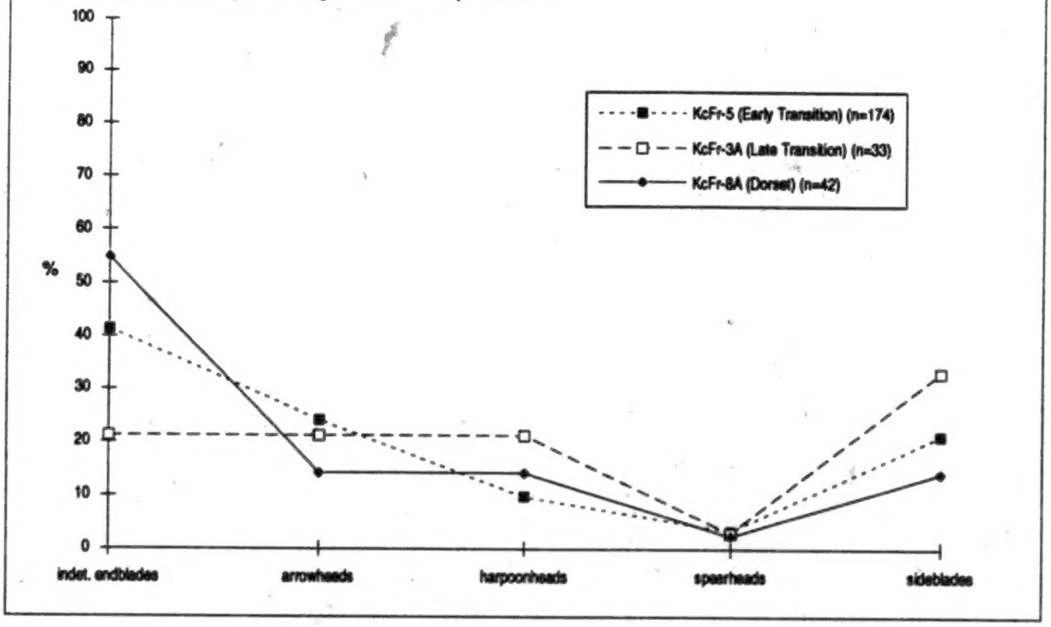


Figure 5.6 Microblades % in assemblages of worked or utilized lithic objects from Ivujivik sites

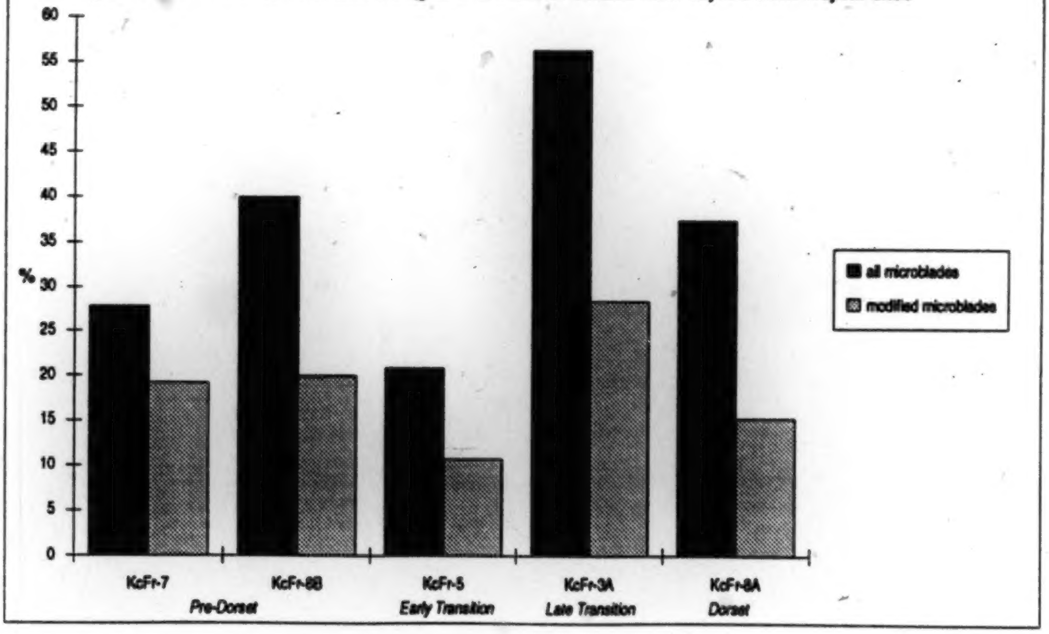
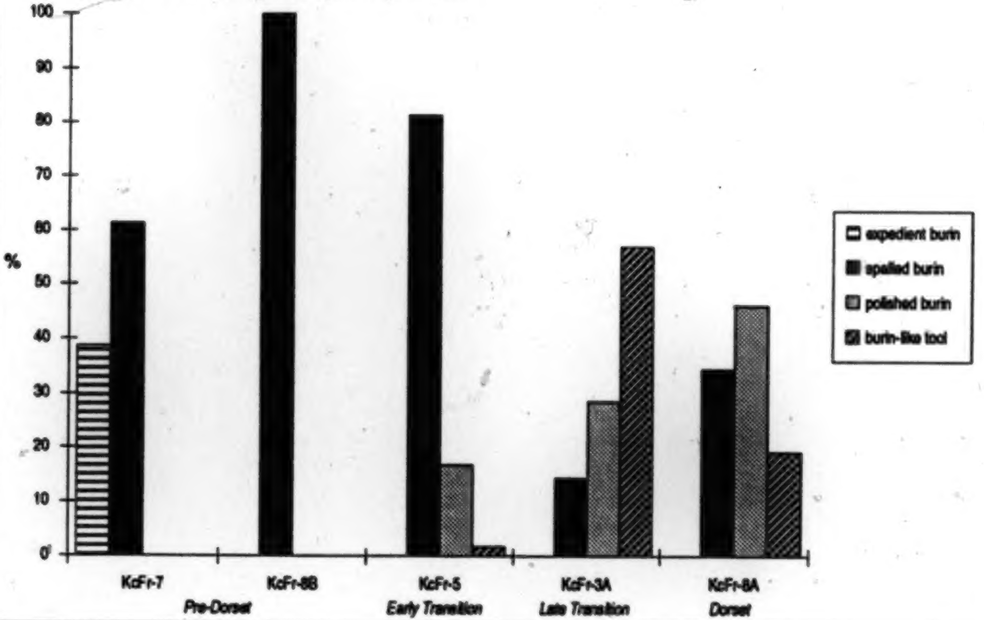


Figure 5.7 Burin categories from Ivujivik sites



Dorset period. In the case of Ivujivik, evidence for polishing appears at the beginning of the transition at KcFr-5. During the late transition, and as represented from the Ohituk site (KcFr-3A), there was a drastic decrease in spalled burins and a corresponding increase in polished burins and, more importantly, in burin-like tools. As mentioned earlier, it is possible that burin-like tools had a longer life time than the spalled burins because of their resharpening technique which involved mainly abrading as opposed to the removal of spalls. Thus, fewer burins at a site might mean that burin-like tools were more often used than were spalled burins.

In the Dorset site (KcFr-8A), however, the burin assemblage is dominated by polished, then spalled burins, and finally burin-like tools. The latter percentage is somewhat surprising since Dorset sites usually have higher percentages of burin-like tools (e.g., Maxwell 1973:337). The different ratios of burins from the Dorset site may reflect more specialization in the tasks performed with each type of burins than had originally been anticipated by Taylor (1968:70).

Subsistence patterns

In order to estimate whether the subsistence patterns of the people who occupied the Ivujivik sites changed through time, the number of species was tabulated for each major class (i.e., birds, land mammals and sea mammals). The results show that the species diversity of birds decreases drastically between the early transition to the Dorset periods, while sea mammal species remain the same (Figure 5.8). In the case of land mammals, the variety of species decreases during the late transition but slightly increases during the Dorset period. These results should be treated with caution as they also reflect the season of occupation and possibly the cyclic fluctuations in the number of species (Hannon, pers. comm. 1996). Thus, if a site was occupied during winter, migratory birds would not be available, unless they had been cached for later consumption. Furthermore, if a site was occupied for longer periods or during repeated visits, then the opportunities to catch a wider variety of species would be increased.

As expected from coastal sites, the comparison of %MNI of birds, land mammals and sea mammals indicates that hunting focused on sea mammals. This specialization decreased slightly during the late transition but increased during the Dorset period (Figure 5.9). The minor decrease in the %MNI of sea mammals during the late transition corresponds to an increase in the %MNI of birds and land mammals that were hunted. In contrast, the increase in the %MNI of sea mammals during the Dorset period is associated with a reduction in the %MNI of birds and that of land mammals, thus indicating a specialization toward marine mammals in term of actual numbers of individual animals hunted.

The low number of bones from the Pre-Dorset sites (KcFr-7 and KcFr-8B) and the overwhelming representation of sea mammals bones at the Pre-Dorset/Dorset transitional sites (KcFr-5 and KcFr-3A) and the Dorset site (KcFr-8A), did not allow proper testing of the assumption concerning the dichotomy between caribou exploitation during Pre-Dorset period and more sealing during the Dorset period. Nevertheless, for the Pre-Dorset/Dorset transitional sites (KcFr-5 and KcFr-3A) and the Dorset site (KcFr-8A), since the small seal bones were grouped by age, it was possible to compare the faunal assemblages in term of %MNI age categories through time.

The results indicate similar patterns in the hunting of juvenile small seals during early and late transition while subadults were more exploited during the Dorset period (Figure 5.10). The predominance of each age group is likely linked to the season during which they were hunted. Indeed, while juveniles (i.e., around 3 month old) would be easy prey during the spring/early summer (Smith 1973:21), subadults come to the coast in June and their presence at a site might indicate a summer occupation. On the other hand, subadults could have been hunted during cold weather seasons. However, the presence of caches containing remains of foetal/newborn and juvenile seals in both the early transition (KcFr-5) and the Dorset (KcFr-8A) sites indicates that at least some food surplus was accumulated during the warmer season to be consumed later. Saladin d'Anglure (1967:180) notes that in northwest Québec, winter was a low period in term of hunting activities since people had accumulated and cached food all through the summer. The possibility remains that some seals hunted during the colder months were also cached.

In the case of the Dorset site (KcFr-8A), the semi-subterranean structure, and possibly the rectangular house, were associated with caches. The more robust frame of these structures suggests that people were present during cold weather and used at least some cached food. The presence of two rectangular houses and associated caches at the early transitional site (KcFr-5) could also indicate a reoccupation of the site during colder weather. Furthermore, it means that collector strategies (see Binford 1980) emerged from the transition at least in the Ivujivik area. This does not mean that food was never cached before. Indeed there are examples of Pre-Dorset sites in Greenland associated with many caches (see Knuth 1968). However, in general, Pre-Dorset sites are not associated with the accumulation of surpluses.

The final comparison of the Ivujivik faunal assemblages concerns the use of small seal carcasses as inferred from the %MAU of the skeletal elements. The results indicate that overall, the transitional sites (KcFr-5 and KcFr-3A) and the Dorset site (KcFr-8A) show a similar pattern in the %MAU, where there is variation, but that the early and late transitional sites are more closely alike (Figure 5.11). The most represented bones are from the upper

Figure 5.8 Number of species per class from Ivujivik sites

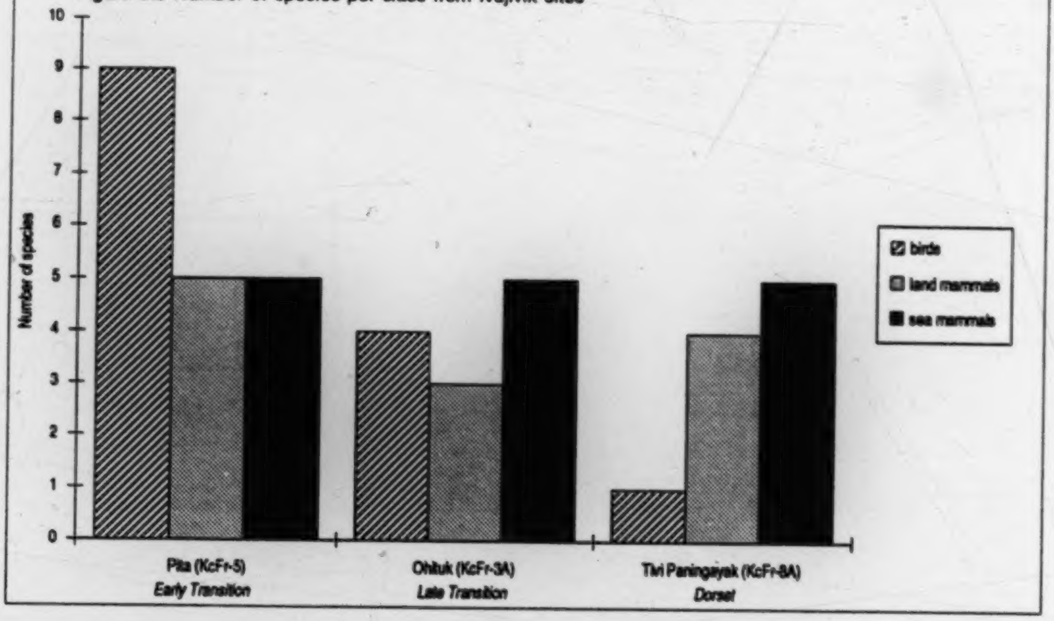


Figure 5.9 %MNI of birds, land mammals and sea mammals from Ivujivik sites

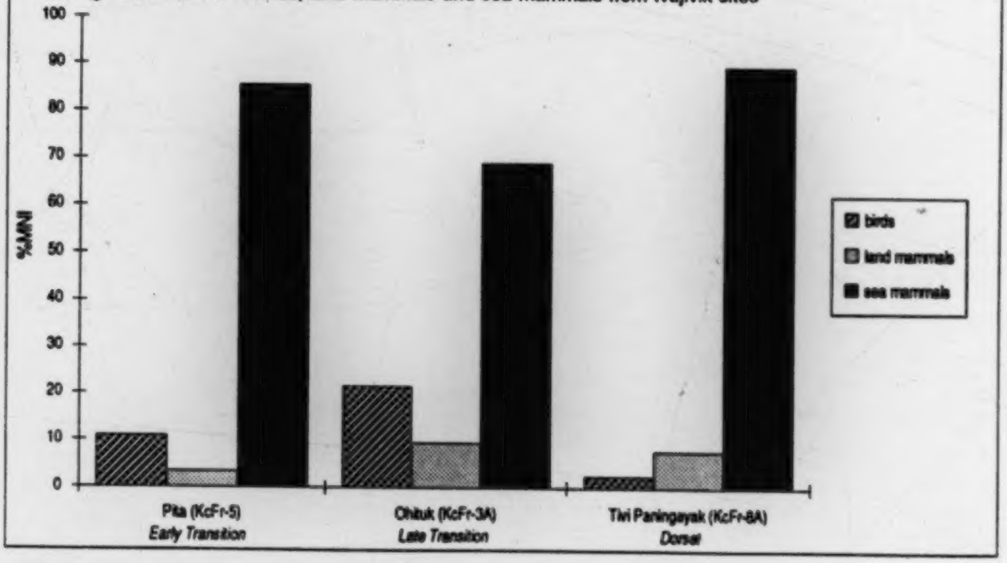


Figure 5.10 %MNI of small seals from Ivujivik sites per age categories

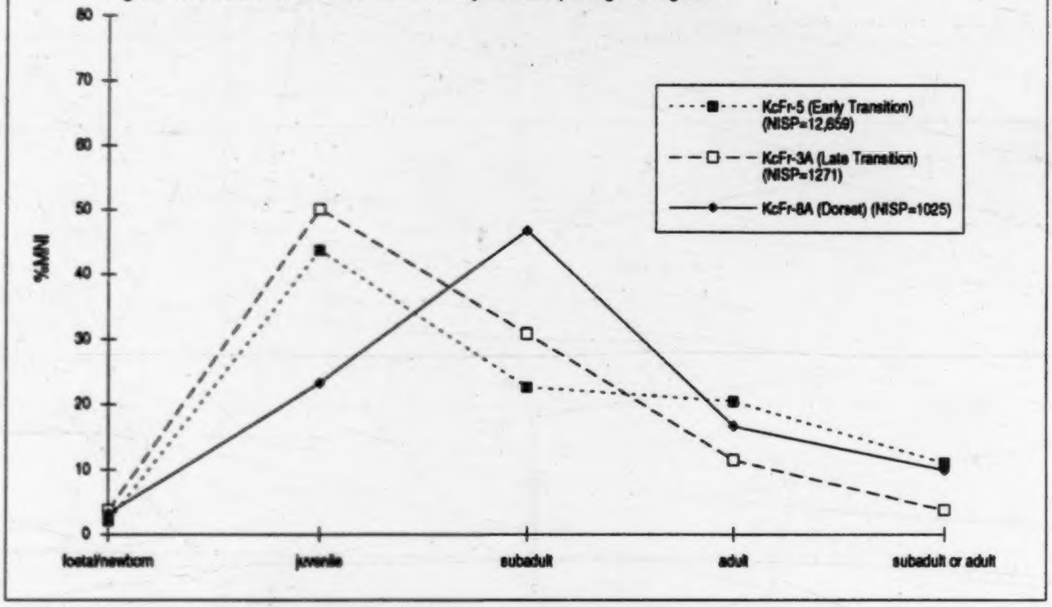


Figure 5.11 %MAU of small seal skeletal parts (all ages) from Ivujivik sites

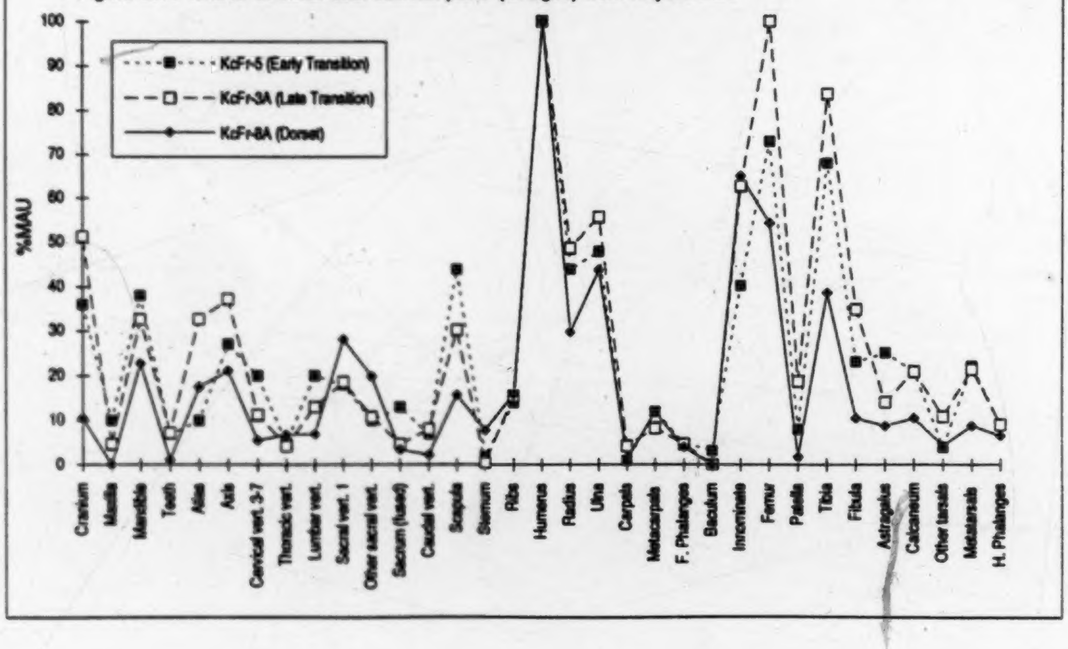


Figure 5.12 %MAU of foetal/newborn small seal skeletal parts from Ivujivik sites

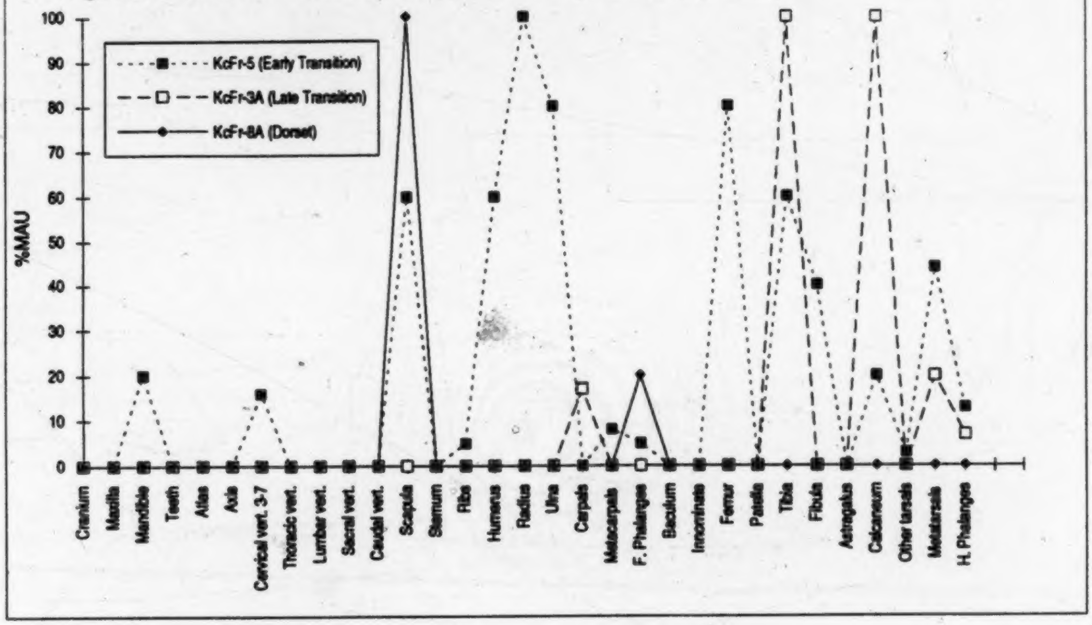


Figure 5.13 %MAU of juvenile small seal skeletal parts from Ivujivik sites

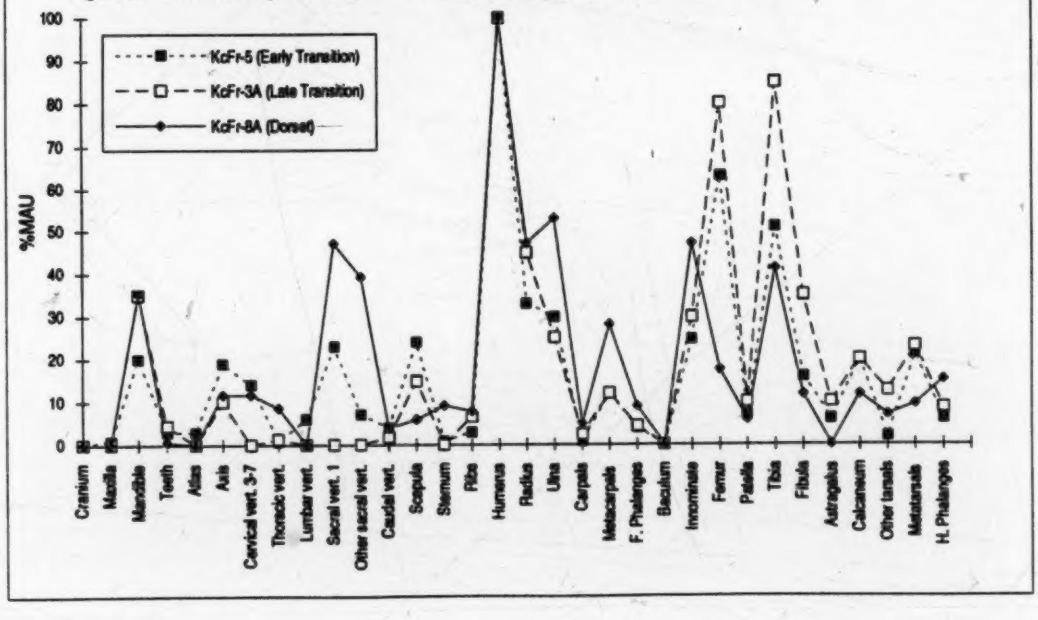


Figure 5.14 %MAU of subadult small seal skeletal parts from Ivujivik sites

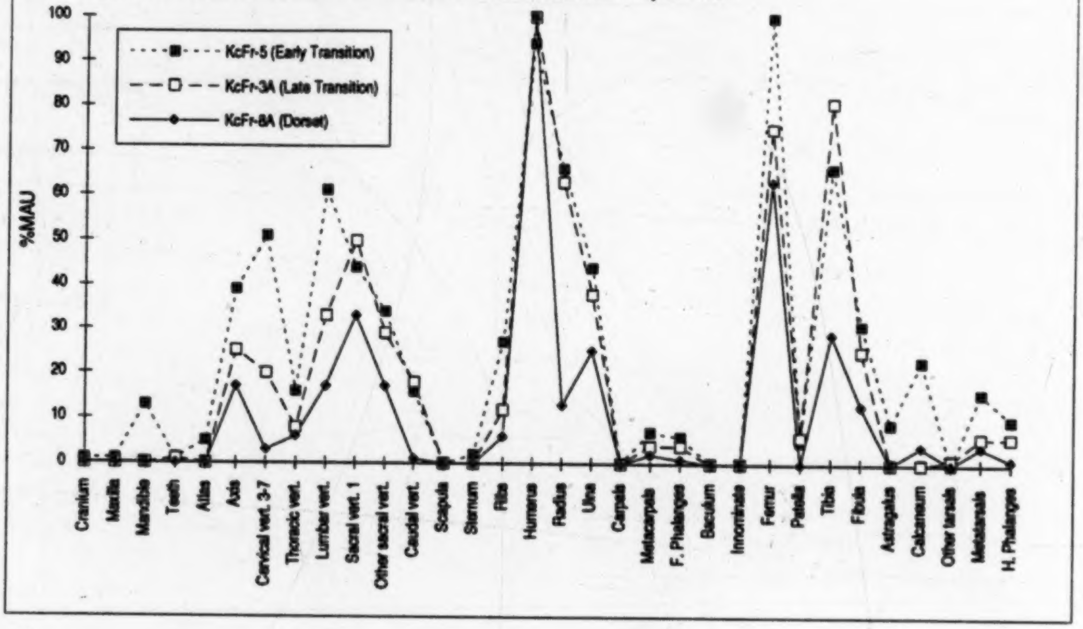


Figure 5.15 %MAU of adult small seal skeletal parts from Ivujivik sites

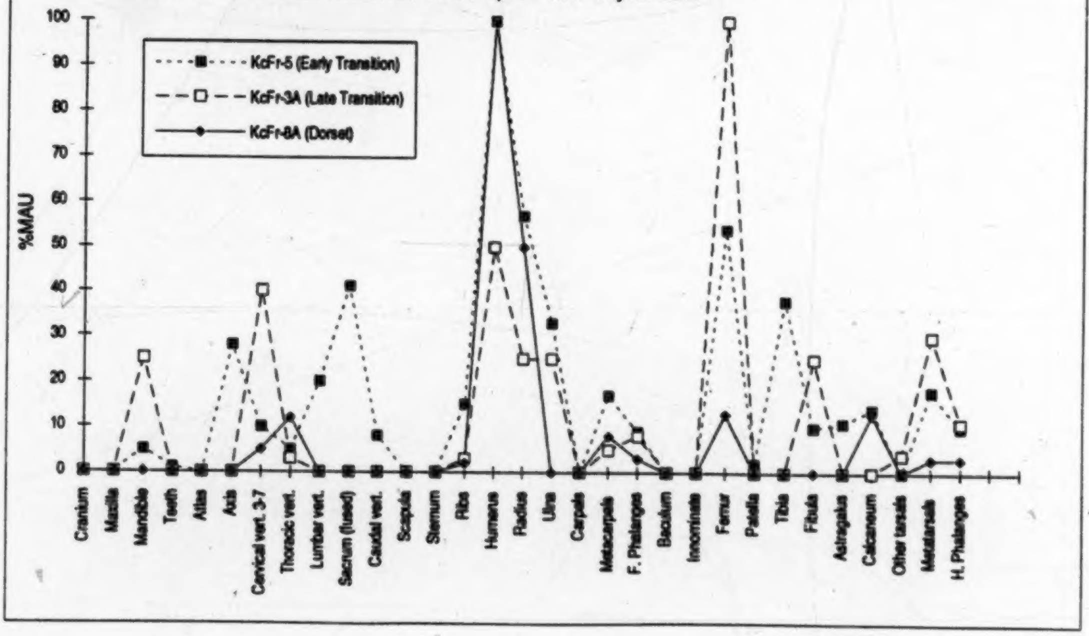
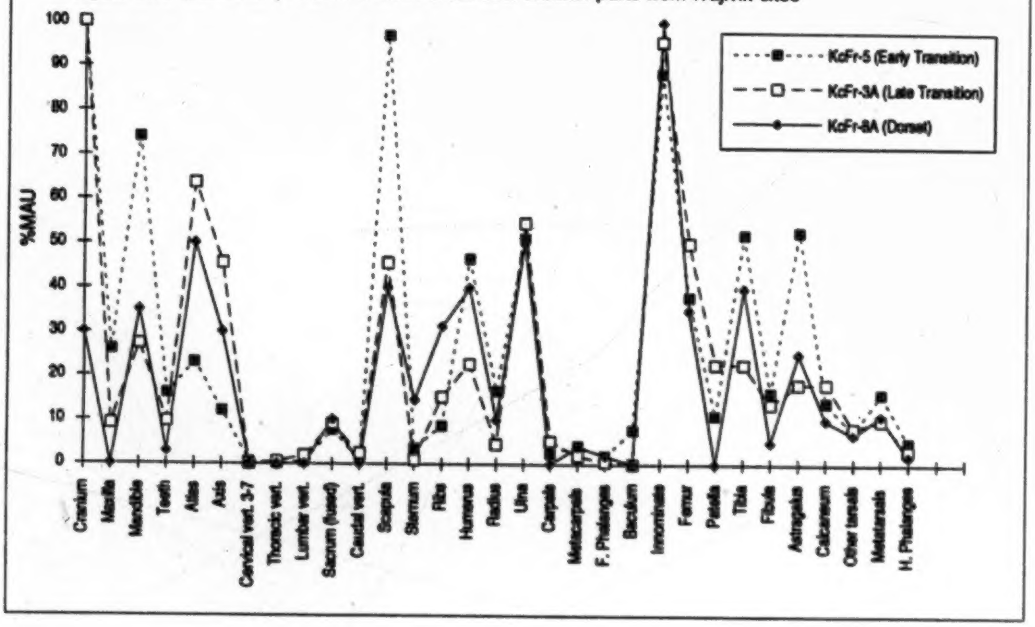


Figure 5.16 %MAU of subadult or adult small seal skeletal parts from Ivujivik sites



parts of the limbs and the innominate. The most under-represented skeletal parts are the bacula and the flippers, although the hind flippers were somewhat better represented. The quasi-absence of bacula might be explained by the exclusive exploitation of juveniles and their mothers. However, even some of the juveniles must have been males and the low representation of the baculum remains puzzling.

As for the elements of the flippers, these bones are relatively dense and should have been better represented. Similar low distributions of flippers are reported by Stenton (1983) from a Thule site on Baffin Island. In contrast, high %MAU for flippers were calculated for small seal bones from a Dorset site in Newfoundland (Murray 1992:92) and from a transitional site from the western Canadian Arctic (Le Blanc 1994:103). Since flippers are reported to be highly valued as a food item and for bone games (e.g., Jenness 1922; Van de Velde 1956), it is unlikely that they would have been discarded at the kill site. Another possibility is that flippers were consumed away from the site perhaps as snack food.

In any case, the overall pattern of %MAU suggests that whole animals were brought back to the sites during the transition and the Dorset periods. Comparison of %MAU for all age groups gave, in general, similar results in skeletal representation (Figures 5.12-5.16) with the exception of the foetal/newborn category (Figure 5.12) where low MNE are certainly responsible for the drastic differences in %MAU.

Although the selective hunting of immature seals may seem maladaptive on the part of the hunters, Krupnik (1993) has recently suggested that it is the adult population that hunters should avoid since even if their young are killed, the sexually mature individuals will be able to reproduce again. Furthermore, the large population of ringed seals would have prevented the overhunting of young individuals, at least before the introduction of the gun. In effect, the estimated number of ringed seals in the late 1960s for the southeast Baffin Island region was about 166,000 (Smith 1973:31).

Summary

The archaeological evidence from Ivujivik has shown that cultural continuity can be traced back from the Dorset to the Pre-Dorset periods and that changes took place within the Pre-Dorset/Dorset transition. Selected variables from settlement patterns, lithic technology, and subsistence patterns, will now be summarized to identify elements related to the development (which implies cultural continuity) and emergence (which implies cultural discontinuity) of cultural changes.

Obviously, the study of settlement patterns between portions of five sites from a single area is somewhat limited. In this research it was furthermore biased towards coastal sites, which were only one of the three major ecological areas exploitable in the Ivujivik region;

that is, the coast, the islands, and the interior. Tent rings were identified in all the sites from Ivujivik, particularly in the Pre-Dorset sites (KcFr-7 and KcFr-8B). The small number of artifacts and faunal material associated with the Pre-Dorset sites suggests short term occupations. Two small rectangular houses from the early transitional site (KcFr-5) were interpreted as possibly ancestral to the semi-subterranean house found in the Dorset site (KcFr-8A).

In the case of lithic technology, increased diversity in the use of raw materials began during the early transition and is likely linked to better knowledge of the territory exploited. Two patterns in the assemblages of major lithic tool categories were identified. The first pattern, associated with the Pre-Dorset and early transitional materials, represents an emphasis in the production of organic implements as well as activities related to hunting and processing of animals. The second pattern, found in the late transitional and Dorset assemblages, reflects activities related almost exclusively to the procurement and processing of animals. The patterns could indicate that Pre-Dorset people and those from the early transition produced and maintained their gear in all their camps while people from the late transition and Dorset periods, arrived at special purpose camps with most of their gear, intending to concentrate mainly in the hunting and butchering of animals.

Furthermore, it appears that during the Pre-Dorset period, the hunters were not specialized in sea mammal hunting as were those of the late transition and Dorset periods. The distribution of different types of endblades showed that the percentage of harpoon endblades was lower at the early transitional site (KcFr-5). Since at that site hunters exploited seal pups in their dens and female seals sun basking on the ice, clubbing them must have sufficed to kill them. There was thus less need for harpoons.

Compared to the Pre-Dorset assemblages of Ivujivik, the percentages of microblades were less numerous during the early transition but they increased drastically during the late transition, then diminished again in number during the Dorset period. The increase in microblades during the late transition is linked to more use of quartz crystal, which was certainly associated with better knowledge of raw material sources. It might also indicate that their function changed through time and that they became increasingly used to flense sea mammals. Furthermore, the percentage of microblades in transitional sites might also correlate with the variety of tools available to people in a camp. In essence, if other cutting tools were present, fewer microblades would be needed.

Comparison of different burin types from the Ivujivik sites indicated that polishing techniques started at the beginning of the transition. In the later part of the transition there was a drastic decrease in spalled burins associated with an increase in polished burins, and more importantly, in burin-like tools.

In Ivujivik, only the transitional and Dorset sites contained faunal remains. As expected from coastal sites, the comparison of the %MNI of birds, land mammals and sea mammals indicates that hunting focused on sea mammals. However, since the variety of species from all the taxa exploited decreased from the early transition to the Dorset periods, it seems that seal hunting became a more specialized activity through time. The hunting of juvenile (i.e., about 3 month old) seals during the spring was favoured during early and late transition while subadults were more exploited during the Dorset period. Furthermore, complete seals were brought back to the campsites. The presence of caches at the early transitional site attests that in Ivujivik the accumulation of food surpluses for later use had started shortly after the Pre-Dorset period.

Understanding the Pre-Dorset/Dorset transition

Archaeological evidence left at Pre-Dorset sites from the Ivujivik area, but also from other sites in the Arctic, suggests that the Pre-Dorset people were still pioneers in the Arctic (e.g., Grønnow 1994:205). They travelled in small family units, changed camps frequently and exploited resources as they encountered them. In other words, Pre-Dorset people were in the process of exploring and understanding vast areas of the Arctic. For hundreds of years they were rather conservative in their manufacture of lithic tools (see Maxwell 1985) and used almost exclusively chert as their major raw material. It seems that their use of the land was that of foragers (see Binford 1980) who stayed for short periods of time in any given site and exploited the resources in an opportunistic manner. There are a few exceptions to that pattern, in particular in Greenland where some groups of Pre-Dorset people were able to specialize their hunting on caribou and/or musk-ox (e.g., Knuth 1968; Grønnow 1994). However, in general the land exploitation of the Pre-Dorset people was similar to that described for Paleoindians who entered North America (see Kelly and Todd 1988). This does not mean that people were maladapted, inflexible or incapable of coping with the different environments of the Arctic. Nevertheless, they were still in the process of acquiring knowledge concerning available resources in the areas they visited.

Around 2800 years B.P., the descendants of the Pre-Dorset people started to use the Ivujivik area more intensively. After occupying the territory in a highly nomadic and rather exploratory manner during the Pre-Dorset period, people were now coming back year after year to the same hunting grounds. This was a new adaptation based on the exploitation of the territory according to the availability of animals at specific seasons. On the Ivujivik Peninsula, people began mainly to hunt seals during the spring and accumulated food surpluses for later use. This strategy is associated with collectors (see Binford 1980) who had a seasonal round of sites to exploit. People also started to use a wider range of lithic sources and made changes in their use of technology.

As was discussed earlier in this chapter, the percentages of lithic tools from the early transition site (KcFr-5) gave a pattern that was interpreted as associated with forager strategies. In effect, the high number of burins was perceived as indicating that people did not prepare their equipment prior to their visit to the site. They "geared up" (see Binford 1979) once at the site. This pattern would seem to contradict the presence of caches at the same site, since they are typical features of collector camp sites. However, the fact that the site was occupied during a period of transition might explain the situation. In effect, people may have kept some forager behaviours while transforming their overall adaptation to that of collectors. Indeed they may have used the site for many years in a "serial specialist" fashion (see Binford 1980:17) to exploit a specific resource (seal) at a specific time of the year (spring/early summer) before starting to cache food in anticipation of coming back later.

Furthermore, in the case of the late transition site (KcFr-3A), no caches were found but the pattern associated with the percentages of lithic tools was similar to that of the Dorset site (KcFr-8A) that had caches. The pattern indicated that the major activities at the site were linked to the hunting and processing of seals. Preparation of hunting gear must have been done prior to arrival at the site. Once there, tools were mostly maintained and repaired rather than manufactured. The fact that the late transition site (KcFr-3A) contained no caches suggests that it was used for the specific purpose of hunting seals without the anticipation of returning there later and thus no food was cached. The late transition site (KcFr-3A) would still be part of the logistical types of sites produced by collectors (see Binford 1980).

The reasons for the shift in adaptation from foragers to collectors are difficult to identify, especially when looking at sites from a single area. As was seen in Chapter 1, most cultural changes in the Arctic have been traditionally explained with reference to environmental conditions: the climate became colder or warmer, affecting animal populations and ultimately the behaviour of people. In a recent article on transitional and Dorset sites from Phillip's Garden in Newfoundland, Renouf (1993) reviewed climate studies and linked the period between 3000-2200 B.P. (i.e., the transition) to one of unstable cold conditions which would have meant unpredictable sea mammal resources. According to her, the people who lived during the transition had to generalize their subsistence base as well as live in small groups "so that moves to new resource locations can be made quickly in response to changing circumstances" (Renouf 1993:207). As for the Dorset period, Renouf (1993) equates it with warmer temperatures at around 2200 B.P. At that time people made more intensive use of sea mammal resources, stayed longer at the site and were more numerous in term of group size (Renouf 1993).

It should be noted that although the transitional sites from Phillip's Garden were indeed small with little cultural deposit, as expected for people staying for a short time period, they exploited almost exclusively seals (Renouf 1993:201). It seems to me that the faunal data from these sites indicate the behaviour of foragers who were "serial specialists" (see Binford 1980), that is who focused their hunting on specific resources at least during some seasons, rather than generalize their subsistence base at all times. In fact, the people who occupied Phillip's Garden during the transition might have been in the process of shifting from a foraging to a collecting strategy, as the people who occupied the early transitional site (KcFr-5) in Ivujivik.

Furthermore, if the unpredictability of sea mammal resources was the norm during the transition through the whole Eastern Arctic and if the transitional sites from Phillip's Garden represent the remains of generalists (see Renouf 1993), then the people who occupied the Ivujivik sites responded differently from those of Phillip's Garden to that situation. In effect, their strategy was to specialize in the hunting of seals at least in the spring/early summer and to accumulate food surpluses, which implies returning to the same site. A similar pattern is associated with the Dorset occupation. Thus, in the case of the Ivujivik sites, the change of adaptation is not between the transition and the Dorset sites but between the Pre-Dorset and the transition (and Dorset) sites.

Although the climate change hypothesis is attractive, it does not explain why cultural responses came at different rates in the Eastern Arctic. Furthermore it does not take into consideration the fact that people would have needed sufficient knowledge of the land in order to change their adaptive strategy. Another explanation to account for the different land use patterns observed for the Palaeoeskimo periods is precisely about people's knowledge of their environment. It is reasonable to assume that generations of people may have reached a point where familiarity with the land and the exploitation of specific sites at different seasons was preferred to high mobility over vast areas. This proposition remains highly speculative as it cannot be known with any certainty how long it takes for small groups of people to accumulate sufficient information to exploit their surrounding environment in a more efficient manner.

It is nevertheless possible that around 3000 to 2800 B.P., people who exploited the Ivujivik area had accumulated enough traditional knowledge to infer the location of the best hunting grounds in relation to the annual cycle of animals. Knowledge of the land would also include that of safe travelling routes. Thus during the transition, people started to be more specialized in their exploitation of sea mammals, particularly small seals in the spring.

Furthermore, they accumulated surpluses of food for later use. New lithic sources were procured from nearby quarries and probably from trading networks. People living in the Ivujivik area must have included the exploitation of islands and inland resources in their seasonal round. It is also likely that a sense of territoriality was developed during the Pre-Dorset/Dorset transition, since at that time people would have identified themselves with the area they exploited through the year. Their adaptation was linked to their traditional knowledge of a localized area where they started to concentrate their yearly activities.

In his discussion of transitional sites from the southeastern coast of Baffin Island, Maxwell (1985:121) agreed with McGhee (1981:38) that there was a decline in population during the transition, and added that there was also a decrease in relative sedentism. In Ivujivik, although so far more Pre-Dorset sites have been found than transitional ones, few have been excavated. It is very likely that some of these sites were occupied during the transition. In fact, the Pita site (KcFr-5) was originally classified as belonging to the Pre-Dorset period by Taylor (1962a). It is thus difficult to estimate whether the people that exploited the Ivujivik area during the transition were less numerous than their predecessors, or simply generated more sites that were used less often and less intensively. As for the decrease in relative sedentism, the Pre-Dorset sites of Ivujivik do not give the impression that people occupied the area for long terms. On the contrary, they seem to have been in Ivujivik for very short visits. The actual evidence for relative sedentism comes from the early transitional (KcFr-5) and Dorset (KcFr-8A) sites, as witnessed by the presence of caches and the remains of dwellings that would indicate the reoccupation of the sites during a cold season.

It is unlikely that human groups inhabiting the Arctic were either strict foragers or collectors in their adaptive strategies. It is more reasonable to assume that they used the full range of behaviours depending on the circumstances (e.g., Binford 1980; Stenton 1989). However, it seems that overall the archaeological materials left by Pre-Dorset people were those of highly mobile foragers while the people living during the Dorset period left remains associated with the more logistically oriented collectors. It is culture, transmitted through oral tradition, that allowed the descendants of the Pre-Dorset people to transform themselves into what has been called the Dorset people. In the case of the Ivujivik sites, the change to the new adaptive strategy can be traced to the Pre-Dorset/Dorset transition.

CHAPTER 6
Conclusions

The Pre-Dorset /Dorset transition as seen from Ivujivik

Three questions have guided the present study. First, what were the cultural differences that occurred between the Pre-Dorset and the Dorset periods? Second, how can the differences in the archaeological record be interpreted? And third, is the Pre-Dorset/Dorset transition a valid concept? To answer these questions, cultural elements that have been associated with the Pre-Dorset/Dorset transition in the literature were compared to those from five sites occupied from the Pre-Dorset to the Dorset periods, in the Ivujivik area of the Eastern Arctic. Analyses of the artifact and faunal materials within and between sites were performed to identify assemblage variations and possible evidence of a transition in their use through time. In the following sections, each of the questions will be answered. It is followed by an attempt to define the Pre-Dorset/Dorset transition. The chapter concludes with a discussion of traditional knowledge and cultural transitions.

1. What were the cultural differences?

The concept of transition implies cultural continuity of some sort. If the cultural components of the Pre-Dorset and Dorset periods were drastically different, we could not speak about a cultural transition between both periods. We would have to agree with Tuck and Ramsden (1990) that the so-called transitional sites are in fact from the end of the Pre-Dorset culture and have nothing to do with the Dorset culture. As was stated earlier, transitional assemblages should show elements that *developed* from the preceding period, and that *emerged* within the period of cultural transformations. The links between both periods are essential. Without them, the label of transition is unsubstantiated.

In the case of the archaeological material from the Ivujivik sites, elements that *developed* from the Pre-Dorset period, and thus show cultural continuity between the Pre-Dorset and the Dorset periods, are the following:

(1) Spalled burins were used from the Pre-Dorset to the transition periods but diminished in number during the Dorset period.

(2) Microblades were used from the Pre-Dorset to the transition periods. Their number increased drastically during the late transition and then diminished during the Dorset period.

(3) Arrowheads were used from the Pre-Dorset to the Dorset periods, although their number was low during the Dorset period.

In contrast, the following elements *emerged* during the transition and thus emphasize cultural changes that will lead to the transformation to a different cultural adaptation during the Dorset period:

(1) While chert was almost the only lithic material used during the Pre-Dorset period, the diversity of lithic sources increased during the early transition and was maintained through the Dorset period.

(2) Polished burins first appeared during the early transition and their number increased steadily from the late transition to the Dorset periods.

(3) Few burin-like tools can be traced to the early transition period. Their number increased dramatically during the late transition although they decreased somewhat during the Dorset period.

(4) Rectangular houses appeared only during the early transition and might be the prototype of the semi-subterranean houses used during the Dorset period.

(5) Caches were found only during the early transition and the Dorset periods.

(6) Although they were no faunal remains found in the Pre-Dorset sites excavated, a specialization towards sea mammal hunting, and especially the hunting of seals in the spring time, is suggested to have emerged during the transition and to have continued during the Dorset period.

These are the most relevant cultural elements that made me conclude that there were indeed significant cultural changes during the transition. Other traits listed by Maxwell (1985:123) to define the Dorset period are not included in the above lists because they were not present in sufficient number in all sites to allow proper assemblage comparisons. These included an increase in triangular projectile points, often with fluting at the distal tips; the appearance of an extensive ground slate industry; the appearance of multiple side-notched knives and endblades; and the appearance of rectangular soapstone vessels. With the exception of vessel fragments that were found only in the Dorset site (KcFr-8A), all these traits were found in both transitional and Dorset sites from Ivujivik. Their presence during both periods should thus be interpreted as elements that emerged from the transition.

Furthermore, none of the organic implements associated with winter activities and listed by Maxwell (1985:123) were found at the Ivujivik sites. In the case of the transitional and Dorset sites where organic preservation is good, this absence probably indicates that most occupations took place during warm months. As for the presumably magic-related art associated with the Dorset period, at least one small carving of a polar bear was found at the transitional site (KcFr-5). However, the lack of organic materials in the Pre-Dorset sites does not allow one to infer that such magic-related art emerged only during the transition.

In other words, magic-related art might have been present during the Pre-Dorset period but they did not preserve well through time.

2. How can the differences be interpreted?

From about 4000 to 3000 years B.P., small groups of Pre-Dorset people started to explore the Ivujivik peninsula. They travelled in small family units, changed camps frequently and exploited resources as they encountered them. They left behind sites with the remains of tent rings associated with few artifacts. For hundred of years they were rather conservative in their manufacture of lithic tools and used almost exclusively chert as their major raw material. Their use of the land was that of foragers (see Binford 1980) who stayed for short periods of time in any given site and exploited the resources in an opportunistic manner.

At around 2800 years B.P., the descendants of the Pre-Dorset people started to use the Ivujivik area more intensively. After occupying the territory in a highly nomadic and rather exploratory manner during the Pre-Dorset period, people were now coming back year after year to the same hunting grounds. This was a new adaptation based on the exploitation of the territory according to the availability of animals at specific seasons. On the Ivujivik peninsula people mainly hunted seals during the spring and accumulated food surpluses for later use. This strategy is associated with collectors (see Binford 1980) who had a seasonal round of sites to exploit. During the transition, people started to built more permanent habitation structures made of sod, used a wider range of lithic sources, and made changes in their use of technology.

Two explanations were presented to account for the changes in adaptive strategy. The first one is the unstable cold climate that has been linked to the transition (Renouf 1993). The second one, which I favoured, relates to people's knowledge of their environment. It is possible that people may have reached a point where familiarity with the land and the exploitation of specific sites at different seasons was preferred to high mobility over vast areas. Thus, at around 3000 to 2800 B.P., people who exploited the Ivujivik area had accumulated enough traditional knowledge to infer the location of best hunting grounds in relation to the annual cycle of animals. Knowledge of the land would also include that of safe travelling routes and the location of lithic sources.

3. Is the Pre-Dorset/Dorset transition a valid concept?

When looked at only by themselves, transitional sites have a mixture of materials that belong to different archaeologically defined cultural entities. Furthermore, transitional sites are plagued with problems related to site formation and temporal control. The possibility will always remain that transitional sites were never occupied during a time of cultural change, but rather during multiple occupations at distinct chronological periods. This will be the case of sites where the stratigraphy, as well as horizontal and vertical artifact refitting, does not allow the isolation of single occupations. As I have demonstrated in this study, it is only when the assemblages of "possible" transitional sites are compared with those from previous and later cultural periods, that one can look for changes in the technology, subsistence, and habitation structures of their occupants.

In the Eastern Arctic, few Pre-Dorset/Dorset transition sites have been so far identified, let alone analyzed. In the years to come, it is expected that more will be found simply because archaeologists are now more aware of their existence. Their identification by Arctic archaeologists shows that our perception of Palaeoeskimo assemblages has become more refined over time. Future research on the Pre-Dorset/Dorset transition should concentrate on interior sites to see if inland adaptations show similar changes to those observed in Ivujivik in the use of lithic sources, technology, habitation structures and food caches.

At this point in our knowledge of Arctic archaeology, the Pre-Dorset/Dorset transition is a usable concept. It is useful precisely for those sites that show a mixture of Pre-Dorset and Dorset materials and where it is impossible to isolate single occupations. However, archaeologists will have to demonstrate through comparative analyses of lithic and faunal materials from other sites occupied before and after the transition, that changes can be isolated. They should also keep in mind that a transitional site is a site that contains cultural elements that developed from the preceding period and those that emerged during the transition. It is not the percentages of microblades or burin-like tools that will determine if a site is transitional. It is only through comparisons with cultural elements from sites occupied before and after the transition that trends towards changes in the settlement patterns, technology, and subsistence strategies, will be identified.

Towards a definition of the Pre-Dorset/Dorset transition

The Pre-Dorset/Dorset transition should not be equated with a specific culture, but looked at as a phase or a stage within the Palaeoeskimo continuum. In fact, even the distinction between the Pre-Dorset and Dorset "cultures," which is often used in the literature in parallel with the Pre-Dorset and Dorset periods, is misleading. We will never know if the cultural differences stressed by archaeologists were relevant to the people who created the sites. Archaeologists may be "victims" of their own arbitrary categories. It would be simpler and less presumptuous to talk about Pre-Dorset and Dorset periods (i.e., chronological), which are part of a greater Palaeoeskimo culture.

Neither can a cultural transition be seen strictly as a chronological period since in some areas, changes may have started or ended at different times. Furthermore, the actual rate of change might be highly variable. As we have seen in the case of the Pre-Dorset/Dorset transition, these changes took place within 200 years (Taylor 1968) or at the most, within 1000 years (Renouf 1993). But when one looks at the Middle/Upper Palaeolithic transition, the changes are thought to have taken place over 15,000 years!

I have problems with the labels of Pre-Dorset and Dorset "cultural traditions" recently suggested by Helmer (1994) as I am not sure if the technological characteristics found in Pre-Dorset and Dorset sites reflect actual differences in the social, economic and ideological systems of the inhabitants of the sites. Nevertheless, I could use Helmer's (1994:21) suggestion that the Pre-Dorset/Dorset transition is a cultural horizon by which he means "a useful taxonomic mechanism for recognizing significant temporal changes in material culture, settlement patterns, subsistence strategies and/or social organization within a single Cultural Tradition" (i.e., Pre-Dorset and Dorset). Also, I think that in this definition social organization would be limited to estimation of the number of people per camp.

My other reserve comes from the fact that Helmer places the Pre-Dorset/Dorset transition under what he calls the Dorset Cultural Tradition. However, and as was demonstrated in this study, some elements of a Pre-Dorset/Dorset transition developed from the Pre-Dorset period (or Cultural Tradition to use his term). Furthermore, since other elements emerged during the transition to be later fully integrated during the Dorset period, the Pre-Dorset/Dorset transition should belong both at the end of the Pre-Dorset *and* the beginning of the Dorset. The Pre-Dorset/Dorset transition cannot be seen as any cultural horizon within a single cultural tradition (i.e., Dorset), but overlapping between the Pre-Dorset and the Dorset cultural traditions.

Traditional knowledge and cultural transitions

The forager and collector strategies defined by Binford (1980) were essential to understand the nature of the Pre-Dorset/Dorset transition from the Ivujivik sites. However, contrary to Binford and other archaeologists who have used his model in the Arctic context (e.g., Savelle 1987; Stenton 1989), I did not believe that climatic and environmental variations determine which strategy a society will utilize the most. I thought that it was the degree of knowledge of the land that would affect how a group of people exploit its environment. I thus expected that people new to an area would tend to behave like foragers, that is exploiting the land in an opportunistic and non-specialized manner, changing base camps frequently and in doing so, leaving few archaeological remains. I also expected that once generations of people accumulated traditional knowledge of a specific area, they would change their adaptive strategy. They might continue to act as foragers, although with a different perspective of their environment, or they might transform themselves into collectors. Both expectations were met as demonstrated by the comparison of archaeological remains from the Ivujivik sites.

Binford's categorization of forager and collector strategies was based on modern ethnographic examples that did not take into consideration how long a group of people had been in a specific area and thus, how much traditional knowledge they had accumulated. In other words, the diachronic nature of traditional knowledge was completely ignored. I think that a collector strategy can be developed only when a group of people has accumulated enough traditional knowledge to organize their activities in a logistical manner. The shift from forager to collector strategies is not a conscious process. The transition from forager to collector, in other words from generalists to specialists (or even to "serial specialists"), was an ongoing cultural process linked to the increasing degree of knowledge of the land. The cultural transition from one adaptive strategy to another would happen at different rates through time and was at first unidirectional. In effect, collectors had to be foragers first. Newcomers had to explore the land before settling in a particular area and exploiting its resources in a logistical fashion. Also, generalists would first become "serial specialists" (see Binford 1980) by exploiting specific resources at certain times of the year before transforming their land-use system to that of collectors who accumulated food surpluses.

In the case of the Middle to Upper Palaeolithic transition, Binford (1982, 1989) identified a shift from foraging to collecting strategies. In fact, all his theorizing on foragers and collectors was aimed at understanding the difference between Mousterian and Upper Palaeolithic assemblages, a subject that interested him since the 1960s (see Binford and Binford 1966). Binford (1982, 1989) now argues that the Middle to Upper Palaeolithic transition in Europe was one from earlier hominids to fully modern humans. According to him, Middle Palaeolithic hominids lacked the ability to organize themselves logistically or to plan hunting strategies.

In my mind, although the Middle to Upper Palaeolithic transition is very different from the Pre-Dorset/Dorset transition in term of time scale, the key concept to understand both cultural transformations is knowledge. In effect, during the Middle to Upper Palaeolithic transition, hominids acquired, through either genetic replacement, evolution, or the development of more complex learned foraging behaviour, the capacity to accumulate knowledge which would allow them to anticipate situations and plan ahead. In other words, they were now able to organize their subsistence-settlement systems logistically.

In the case of the Pre-Dorset/Dorset transition, I have argued that during the Pre-Dorset period people were still in the process of exploring the Ivujivik area with a foraging strategy. The Pre-Dorset/Dorset transition corresponds to a period during which people had accumulated enough traditional knowledge to change from a foraging to a collecting strategy. The latter system allowed people to use an area with a seasonal round in mind and to store food for future use. Contrary to Orquera's (1984) opinion that "preferential hunting brought with it better knowledge of its habits and of the easiest way to capture it," I think that it is better knowledge of the environment that influenced specialized hunting.

Throughout the human history of the Eastern Arctic, some collector groups such as regional populations of the Dorset period, might have ceased, for sociological, demographic, and/or economical reasons, to exploit the area where they identified themselves. I would expect the next people to come to an abandoned area, and which was thus new to them, to first exploit its resources in an opportunistic and foraging manner. This means that depending on their knowledge of an area, human populations were very likely to alternate between foraging and collecting strategies. From an archaeological perspective, this would imply that sites created by foragers and collectors should alternate through time. An exception to this "newcomer-forager" model is the first Thule people who migrated to the Canadian Arctic around A.D. 1000. In that case, these bowhead whale hunters arrived as fully adapted collectors who lived on stored food during the winter months (e.g., Savelle 1987). Nevertheless, I would expect that in areas new to them, the Thule exploited in a foraging manner resources other than bowhead whales. For the first Thule, foraging and collecting strategies were probably complementary in their adaptation system (see also Stenton 1989).

Culture change is a recurring theme in both anthropology and archaeology. Archaeologists have a long tradition of describing changes but they are often limited in finding the conditions that initiated cultural transformations. Archaeologists have concentrated their effort on contrasting different types of adaptations (e.g., "foragers" versus "collector", "generalization" versus "specialization"). By doing so, they continue to describe how these systems function and what kind of archaeological signatures they leave. However, causal explanations are still missing. I have argued in this thesis that archaeologists have ignored one key element in their models of the adaptive strategies, especially when comparing archaeological remains from populations new to an area, to those from their descendants. That essential notion is related to human knowledge, and more specifically traditional knowledge of the land. "Tools in the mind" (see Ridington 1994) were probably as, if not more, important to Palaeoeskimo people than their material culture. It is not a change in the environment that was the impetus to a new adaptation, it was a change in their *perception* (i.e., knowledge) of the environment that allowed people to transform their land-use system.

BIBLIOGRAPHY

Allard M.and G. Tremblay

1983 La dynamique littorale des îles Manitounouk durant l'Holocène. *Zeitschrift für Geomorphologie* 47:61-95.

Aménatech

1984 Archaeological potential study of the airport development area, Ivujivik, Northern Quebec. Unpublished report presented to Makivik Corporation. Sherbrooke.

1985 Archaeological inventory of the Ivujivik airport development area, Northern Quebec. 2 vols. Unpublished report presented to Makivik Corporation. Sherbrooke.

Amorosi, Thomas

1992 Non-metric trait distinctions for the North Atlantic-Eastern Arctic Phocidae. Bioarchaeological Laboratory, Department of Anthropology, Hunter College, New York. Unpublished.

Andrews, J.T., R. McGhee and L. McKenzie-Pollack

1971 Comparisons of elevations of archaeological sites and calculated sea levels in Arctic Canada. *Arctic* 24:210-228.

Arnold, Charles D.

1981 *The Lagoon site (OjRl-3): Implications for Paleoeskimo interactions.* National Museum of Man, Mercury series, Archaeological Survey of Canada, Paper 107. Ottawa.

Arundale, Wendy H.

1981 Radiocarbon dating in Eastern Arctic archaeology: A flexible approach. *American Antiquity* 46:244-271.

Auger, Réginald

1986 Factory Cove: An early Palaeo-Eskimo component from the west coast of Newfoundland. In *Palaeo-Eskimo cultures in Newfoundland, Labrador and Ungava*, pp.111-118, Reports in Archaeology no. 1. Memorial University of Newfoundland, St. John's.

Avataq

1989 Fouilles de sauvetage du site Ohituk (KcFr-3), Ivujivik, Nouveau-Québec. Rapport présenté au Service de l'Environnement, Ministère des Transports du Québec, Québec. Unpublished.

Badgley, Ian

1980 Stratigraphy and habitation features at DIA. 4 (JfEl-4), a Dorset site in Arctic Québec. *Arctic* 33(3):569-584.

Balikci, Asen

1970 *The Netsilik Eskimo*. Garden City. New York.

Banfield, A.W.F.

1981 *The mammals of Canada.* National Museum of Natural Sciences, National Museums of Canada, University of Toronto Press. Toronto.

Barré, Georges

1970 *Reconnaissances archéologiques dans la région de la baie de Wakeham (Nouveau-Québec).* Société d'archéologie préhistorique du Québec. Montréal.

Bell, Robert

1884 Observations on the geology, mineralogy, zoology and botany of the Labrador coast, Hudson's strait and bay. *Canadian Geological and Natural History Survey, Report Progress 1882-83-84, Part DD,* Dawson Brothers. Montreal.

Bennett, John W.

1976 *The ecological transition: Cultural anthropology and human adaptation.* Pergamon Press. New York.

Bielawski, Ellen

1983 Northern archaeology to 1983: A perspective from Arctic prehistory, *The Musk-Ox* 33:37-41

1988 Paleoeskimo variability: The early Archaic Small-Tool tradition in the Central Canadian Arctic. *American Antiquity* 53:52-74.

Binford, Lewis, R.

1979 Organization and formation processes: Looking at curated technologies. *Journal of Anthropological Research* 35:255-273.

1980 Willow smoke and dog's tails: Hunter-gatherer settlement systems and archaeological site formation. *American Antiquity* 45:4-20.

1981 Behavioral archaeology and the "Pompeii premise." *Journal of Anthropological Research* 37:195-208.

1982 The archaeology of place. *Journal of Anthropological Archaeology* 1(1):5-31.

1987 Researching ambiguity: Frames of reference and site structure. In *Method and theory of activity research: An ethnoarchaeological approach,* edited by Susan Kent, pp. 449-512. Columbia University Press. New York.

1989 Isolating the transition to cultural adaptations: An organizational approach. In *The emergence of modern humans: Biocultural adaptation in the later Pleistocene,* edited by Erik Trinkaus, pp.18-41. Cambridge University Press. Cambridge.

Binford, Lewis R. and Sally Binford

1966 A preliminary analysis of functional variability in the Mousterian of Levallois facies. *American Anthropologist* 68:239-259.

Bordes, François

1967 Considérations sur la typologie et les techniques dans le Paléolithique. *Quartär* 18:25-55.

1968 *The Old Stone Age.* McGraw-Hill. New York.

Bostock, H. S.

1972 Physiographic subdivisions of Canada. In *Geology and economic minerals of Canada,* edited by R.J.W. Douglas, pp.9-30. Geological Survey of Canada.

Economic Geology, Report no. 1, Department of Energy, Mines and Resources, Ottawa.

Bournérias, Marcel
1971 Observations sur la flore et la végétation des environs de Puvirnituq (Nouveau-Québec). *Naturaliste Canadien* 98(3):261-318.

Carr, C.
1984 The nature of organization of intrasite archaeological records and spatial analytic approaches to their investigation. In *Advances in archaeological method and theory*. vol. 7, edited by Michael B. Schiffer, pp.103-222. Academic Press. New York.

Chase, Philip G.
1989 How different was Middle Paleolithic subsistence? A zooarchaeological perspective on the Middle to Upper Paleolithic transition. In *The human revolution: Behavioural and biological perspectives on the origins of modern humans*, edited by Paul Mellars and Chris Stringer, pp.321-337. Edinburgh University Press. Edinburgh.

Clark, Peter U. and William W. Fitzhugh
1992 Postglacial relative sea level history of the Labrador coast and interpretation of the archaeological record. In *Paleoshorelines and prehistory: An investigation of method*, edited by Lucille Lewis Johnson and Melanie Stright, pp. 189-214. CRC Press. Boca Raton.

Clark, G.A. and J.M. Lindly
1989 The case of continuity: Observations on the biocultural transition in Europe and western Asia. In *The Human revolution: Behavioural and biological perspectives on the origins of modern humans*, edited by Paul Mellars and Chris Stringer, pp.626-676. Edinburgh University Press. Edinburgh.

Collins, Henry
1951 The origin and antiquity of the Eskimo. *Smithsonian Report for 1950*. pp. 423-467. Smithsonian Institute. Washington.

1957 The T-1 site at Native Point, Southampton Island, N.W.T. *Anthropological Papers of the University of Alaska* 4:63-89

Cox, Seven L.
1978 Paleo-Eskimo occupations of the north Labrador coast. *Arctic Anthropology* 15:96-118.

Damas, David
1972 Central Eskimo systems of food sharing. *Ethnology* 11(3):220-240.

Dekin, Albert A. Jr.
1976 Elliptical analysis: An heuristic technique for the analysis of artifact clusters. In *Eastern Arctic prehistory: Paleoeskimo problems*. edited by Moreau S. Maxwell, pp.79-88. Memoirs of the Society for American Archaeology. Paper 31.

Dibble, H.
1987 The interpretation of Middle Paleolithic scraper morphology. *American Antiquity* 52:109-117.

Dunnel, Robert C.
1978 Style and function: A fundamental dichotomy. *American Antiquity* 43:192-202.

Dyke, Arthur S.
1993 Glacial and sea level history of Lowther and Griffith Islands, Northwest Territories: A hint of tectonics. *Géographie physique et Quaternaire* 47(2): 133-145.

Earl, Timothy K. and Andrew L. Christenson
1980 *Modeling change in prehistoric subsistence economy.* Academic Press. New York.

Elling, Henrik
1992 The Paleo-Eskimo cultures in northern Greenland and northeastern Greenland in relation to the west Greenland cultures. Paper presented at "The Paleo-Eskimo cultures of Greenland- New perspectives in Greenlandic archaeology," Symposium at the Institute of Prehistoric and Classical Archaeology, University of Copenhagen. Copenhagen.

Enloe, James Gordon
1991 Subsistence organization in the Paleolithic: Carcass refitting and food sharing at Pincevent. Unpublished Ph.D. dissertation. University of New Mexico. Albuquerque.

1992 Le partage de la nourriture à partir des témoins archéologiques: une application ethnoarchéologique. In *Ethnoarchéologie: justification, problèmes, limites,* pp.307-323. 12e Rencontres internationales d'archéologie et d'histoire d'Antibes. Édition APCDA. Juan-les-Pins.

Fienup-Riordan, Ann
1983 *The Nelson Island Eskimo: Social structure and ritual distribution.* Alaska Pacific University Press. Anchorage.

Fitzhugh, William W.
1972 *Environmental archaeology and cultural systems in Hamilton Inlet, Labrador: A survey of the central Labrador coast from 3000 B.C. to the present.* Smithsonian Contributions to Anthropology no. 16, Smithsonian Institution. Washington.

1976 Environmental factors in the evolution of Dorset culture: A marginal proposal for Hudson Bay. In *Eastern Arctic prehistory: Paleoeskimo problems,* edited by Moreau S. Maxwell, pp.139-149. Memoirs of the Society for American Archaeology, Paper 31.

1980 A Review of Paleo-Eskimo culture history in southern Quebec-Labrador and Newfoundland. *Études Inuit Studies* 4:21-31.

Flannery, Kent V.
1973 Evolution of complex settlement systems. In *The early Mesoamerican village,* edited by K.V. Flannery, pp.162-173. Academic Press. New York.

Gauvin, Hélène
1990 Analyses spatiales d'un site dorsétien, le sous-espace D de DIA.4. 2 vols. Unpublished Master's thesis, Département d'anthropologie, Université de Montréal. Montréal.

Gebauer, Anne Brigitte and T. Douglas Price (editors)
1992 *Transitions to agriculture in prehistory*. Monographs in World Archaeology, vol. 4. Prehistory Press. Madison.

Gendron, Daniel
1990 The JgEj-3 site: A Groswater occupation in northwestern Ungava Bay. Paper presented at the 23rd Annual meeting of the Canadian Archaeological Association. Whitehorse.

Guédon, Marie-Françoise
1967 Organisation des activités féminines dans la communauté esquimaude d'Ivujivik (Nouveau-Québec) en 1966. Unpublished Master's thesis, Département d'anthropologie, Université de Montréal. Montréal.

Giddings, J. Louis
1964 *The archaeology of Cape Denbigh*. Brown University Press. Providence.

1967 *Ancient men of the Arctic*. University of Washington Press. Seattle.

Gordon, Bryan C.
1990 Functional analysis of barrenland Pre-Dorset burin-related tools. Paper presented at the 23rd Annual meeting of the Canadian Archaeological Association. Whitehorse.

Graburn, Nelson
1969 *Eskimos without igloos: Social development in Sugluk*. Little Brown. Boston.

1972 *Eskimos of northern Canada*. 2 vols. Human Relation Area files. New Haven.

Grayson, Donald K.
1984 *Quantitative zooarchaeology: Topics in the analysis of archaeological faunas*. Academic Press. Orlando.

Grønnow, Bjarne
1994 Qeqertasussuk - the archaeology of a frozen Saqqaq site in Disko Bugt, West Greenland. In *Threads of Arctic prehistory: Papers in honour of William E. Taylor, Jr.*, edited by David Morrison and Jean-Luc Pilon, pp. 197-238. Canadian Museum of Civilization, Mercury series, Archaeological Survey of Canada, Paper 149. Hull.

Harp, Elmer Jr.
1964 The cultural affinities of the Newfoundland Dorset Eskimos. *National Museum of Canada, Bulletin 200*. Queens Printer. Ottawa.

1976 Dorset settlement patterns in Newfoundland and southeastern Hudson Bay. In *Eastern Arctic prehistory: Paleoeskimo problems*, edited by Moreau S. Maxwell, pp.119-138. Memoirs of the Society for American Archaeology, Paper 31.

Harrold, Francis, B.
1989 Mousterian, Châtelperronian and Early Aurignacian in western Europe: Continuity or discontinuity? In *The Human revolution: Behavioural and biological perspectives on the origins of modern humans*, edited by Paul Mellars and Chris Stringer, pp.677-713. Edinburgh University Press. Edinburgh.

Helmer, James W.

1987 Cultural classificatory terminology in eastern Arctic prehistory: The horse isn't dead yet! Paper presented at the 20th Annual meeting of the Canadian Archaeological Association, Calgary.

1991 The Palaeo-Eskimo Prehistory of the north Devon lowlands. *Arctic* 44(4):301-317.

1994 Resurrecting the spirit(s) of Taylor's Carlsberg culture: Cultural traditions and cultural horizons in eastern Arctic prehistory. In *Threads of Arctic prehistory: Papers in honour of William E. Taylor, Jr.*, edited by David Morrison and Jean-Luc Pilon, pp. 15-34. Canadian Museum of Civilization, Mercury series, Archaeological Survey of Canada, Paper 149. Hull.

Henry, Donald O., Stephen A. Hall, Harold J. Hietala, Yuri E. Demidenko, Vitaly I. Usik, Arlene M. Rosen and Patricia A. Thomas

1996 Middle Paleolithic Behavioral Organization: 1993 Excavation of Tor Faraj, Southern Jordan. *Journal of Field Archaeology* 23(1):31-53.

Hickey, Clifford

1984 The historic Beringian trade network: Its nature and origins. In *Thule Eskimo culture: An anthropological perspective*. National Museum of Man, Mercury Series, Archaeological Survey of Canada, Paper 88. Ottawa.

Hillaire-Marcel, C.

1976 La déglaciation et le relèvement isostatique sur la côte est de la baie d'Hudson. *Cahiers de géographie de Québec* 50:185-220.

Hood, Bryan

1986 Nukasusutok-12: Early/Middle Dorset axial structures from the Nain region, Labrador. In *Palaeo-Eskimo cultures in Newfoundland, Labrador and Ungava*, pp.49-64, Reports in Archaeology no. 1. Memorial University of Newfoundland. St. John's.

Holtved, Erik

1967 Contributions to Polar Eskimo ethnography. *Meddelelser om Grønland* 182 (2). Copenhagen.

Jenness, Diamond

1922 Life of the Copper Eskimos. *Report of the Canadian Arctic Expedition, 1913-1918.* Vol. 12(B). Ottawa.

1925 A new Eskimo culture in Hudson Bay. *The Geographical Review* 15:428-37.

Jochim, Michael A.

1976 *Hunter-gatherer subsistence and settlement: A predictive model.* Academic Press. New York.

1981 *Strategies for survival: Cultural behavior in an ecological context.* Academic Press. New York.

Johnson, Eileen
1985 Current development in bone technology. In *Advances in archaeological method and theory*, vol. 8, edited by Michael B. Schiffer, pp.157-235. Academic Press. New York.

Jones, George T. and Robert D. Leonard
1989 The concept of diversity: An introduction. In *Quantifying diversity in archaeology*, edited by Robert D. Leonard and George T. Jones, pp.1-3. Cambridge University Press. Cambridge.

Kelly, Robert L. and Lawrence C. Todd
1988 Coming into the country: Early Paleoindian hunting and mobility. *American Antiquity* 53(2):231-244.

Kennett, Brenda L.
1990 Phillip's Garden East: An examination of the Groswater Palaeo-Eskimo phase. Unpublished Master's thesis. Department of Anthropology, Memorial University of Newfoundland. St. John's.

King, Judith E.
1983 *Seals of the world.* Oxford University Press. London.

Kirch, Patrick V.
1980 The archaeological study of adaptation: Theoretical and methodological issues. In *Advances in Archaeological Method and Theory*, vol. 3, edited by Michael B. Schiffer, pp.101-148. Academic Press. New York.

Knuth, Eigil
1967 *Archaeology of the Musk Ox Way*. Contributions du centre d'études Arctiques et Finno-Scandinaves no. 5. École pratique des Hautes Études, Sorbonne. Paris.

1968 The Independence II bone artifacts and the Dorset evidence in north Greenland. *Folk* 10:61-80

Krupnik, Igor
1993 *Arctic adaptations. Native whalers and reindeer herders of northern Eurasia.* Darmouth College, University Press of New England. Hanover.

Larsen, H. and J. Melgaard
1958 Paleo-Eskimo cultures in Disko Bay, west Greenland. *Meddelelser om Grønland* 161:1-75.

Larson, Mary Ann
1991 Determining the function of a "men's house." In *The archaeology of gender: Proceedings of the twenty-second Chacmool annual conference of the University of Calgary*, edited by Dale Walde and Noreen D. Wilson, pp.165-175,. Archaeological Association, University of Calgary. Calgary.

Le Blanc, Raymond J.
1994 *The Crane site and the Palaeoeskimo period in the western Canadian Arctic.* Canadian Museum of Civilization, Mercury Series, Archaeological Survey of Canada, Paper 148. Hull.

Leechman, Douglas
1943 Two new Cape Dorset sites. *American Antiquity* 8(4):363-75.

Litwinionek, Luc
1990 La variabilité dans les assemblages archéologiques. Étude du cas de deux sites dorsétiens de la côte septentrionale de l'île de Baffin. Unpublished Master's thesis, Département d'anthropologie, Université de Montréal. Montréal.

Loring, Stephen and Steven Cox
1986 The Postville Pentecostal Groswater site, Kaipokok Bay, Labrador. In *Palaeo-Eskimo cultures in Newfoundland, Labrador and Ungava*, pp.65-94. Reports in Archaeology no. 1. Memorial University of Newfoundland. St. John's.

Low, Albert Peter
1902 Report on an expedition on the east coast of Hudson Bay from Cape Wolstenhome to the south end of James Bay. *Geological Survey of Canada. Annual Report 1900*, N.S., vol. 13, part D, King's Printer, Ottawa.

1906 *The cruise of the Neptune. Report on the Dominion Government expedition to Hudson Bay and the Arctic Islands on board the D.G.S. Neptune, 1903-1904.* Government Printing Bureau. Ottawa.

Lyman, R. Lee
1992 Prehistoric seal and sea-lion butchering on the southern Northwest Coast. *American Antiquity* 57(2): 246-261.

1994a Quantitative units and terminology in zooarchaeology. *American Antiquity* 59(1):36-71.

1994b *Vertebrae taphonomy*. Cambridge University Press. Cambridge.

1995 On the evolution of marine mammal hunting on the west coast of North America. *Journal of Anthropological Archaeology* 14:45-77.

Lyman, R. Lee, James M. Savelle and Peter Whitridge
1992 Derivation and application of a meat utility index for phocid seals. *Journal of Archaeological Science* 19:531-555.

McCartney, Peter, H. and James W. Helmer
1989 Marine and terrestrial mammals in High Arctic Paleoeskimo economy. *Archaeozoologia* 31(1-2):143-160.

McGhee, Robert
1970 A quantitative comparison of Dorset culture microblade samples. *Arctic Anthropology* 7(2):89-96.

1976 Paleoeskimo occupations of Central and High Arctic Canada. In *Eastern Arctic prehistory: Paleoeskimo problems*, edited by Moreau S. Maxwell, pp. 15-38. Memoirs of the Society for American Archaeology, Paper 31.

1978 *Canadian Arctic prehistory*. National Museum of Man, Archaeological Survey of Canada, Ottawa.

1979 *The Paleoeskimo occupations at Port Refuge, High Arctic, Canada.* National Museum of Man, Mercury Series, Archaeological Survey Canada, Paper 92. Ottawa.

1980 Individual stylistic variability in Independence 1 stone tool assemblages from Port Refuge, N.W.T. *Arctic* 33:443-453.

1981 *The Dorset occupations in the vicinity of Port Refuge, High Arctic Canada,* National Museum of Man, Mercury Series, Archaeological Survey Canada, Paper 105. Ottawa.

1982 Comment on P. Plumet's paper. *Études Inuit Studies* 6(1):155-157.

1983 Eastern Arctic prehistory: The reality of a myth? *The Musk-Ox* 33:21-25.

1988 The prehistory and prehistoric art of the Canadian Inuit. In *Inuit Art: An Anthology*, edited by Alma Houston, pp.12-20. D.W. Friesen & Sons. Altona.

McGhee, Robert and James A. Tuck
1976 Un-dating the Arctic. In *Eastern Arctic prehistory: Paleoeskimo problems,* edited by Moreau S. Maxwell, pp. 6-14. Memoirs of the Society for American Archaeology, Paper 31.

McLaren, I. A.
1958 The biology of the ringed seal (*Phoca hispida* Schreber) in the eastern Canadian Arctic, *Fisheries Research Board of Canada.* Bulletin 118. Ottawa.

Marean, Curtis W.
1986 Seasonality and seal exploitation in the southwestern Cape, South Africa. *The African Archaeological Review* 4:135-149

Marks, Anthony E.
1990 The Middle and Upper Palaeolithic of the Neat East and the Nile valley: The problem of cultural transformation. In *The emergence of modern humans: An archaeological perspective*, edited by Paul Mellars, pp.56-80. Edinburgh University Press. Edinburgh.

Mary-Rousselière, Guy
1980 *Qitdlarssuaq, l'histoire d'une migration polaire.* Presses de l'Université de Montréal. Montréal.

Maxwell, Moreau S.
1960 An archaeological analysis of eastern Grant Land, Ellesmere Island, N.W.T. In Contributions to Anthropology in 1960. pp.20-55, *National Museum of Canada, Bulletin 180.* Ottawa.

1973 *Archaeology of the Lake Harbour district, Baffin Island.* National Museum of Man, Mercury series, Archaeological Survey of Canada, Paper 6. Ottawa.

1976 Pre-Dorset and Dorset artifacts: The view from Lake Harbour. In *Eastern Arctic prehistory: Paleoeskimo problems,* edited by Moreau S. Maxwell, pp.58-78. Memoirs of the Society for American Archaeology, Paper 31.

1984 Pre-Dorset and Dorset prehistory of Canada. In *Arctic*, edited by David Damas, pp.359-368, Handbook of North American Indians, vol. 5, W.C. Sturtevant, general editor. Smithsonian Institute. Washington, D.C.

1985 *Prehistory of the Eastern Arctic*. Academic Press. New York.

Melgaard, Jørgen
1960 Prehistoric sequences in the Eastern Arctic as elucidated by stratified sites at Igloolik. *Selected papers of the 5th International congress of anthropological and ethnological sciences, 1956*. University of Pennsylvania Press. Philadelphia.

1962 On the formative period of the Dorset culture. In *Prehistoric cultural relations between Arctic and temperate zones of North America*, edited by John M. Campbell, pp.92-95. Arctic Institute of North America, Technical Paper 11. Montreal.

Mellars, Paul
1989 Technological changes at the Middle-Upper Paleolithic transition: Economic, social and cognitive perspectives. In *The Human revolution: Behavioural and biological perspectives on the origins of modern humans*, edited by Paul Mellars and Chris Stringer, pp.338-365. Edinburgh University Press. Edinburgh.

Mithen, Steven
1990 *Thoughtful foragers. A study of prehistory decision making*. Cambridge University Press. Cambridge.

Møbjerg, Tinna
1986 A contribution to Paleoeskimo archaeology in west Greenland. *Arctic Anthropology* 23(1-2):19-56

1988 Préhistoire du Gröenland. *L'Anthropologie* 92(3):945-968

Morrison, David
1989 Radiocarbon dating Thule culture. *Arctic Anthropology* 26(2):48-77.

Müller-Wille, Ludger
1990 Places and names in Nunavik. *Tumivut* 1:40-44

Murray, Maribeth S.
1992 Beyond the laundry list: The analysis of faunal remains from a Dorset dwelling at Phillip's Garden (EeBi 1), Port au Choix, Newfoundland. Unpublished Master's thesis, Department of Anthropology, Memorial University of Newfoundland. St. John's.

Murray, P.
1966 Faunal analysis of the Nanook site. Manuscript on file. Department of Anthropology, Michigan State University.

Nagle, Christopher
1984 Lithic raw materials procurement and exchange in Dorset culture along the Labrador coast. Unpublished Ph.D. dissertation, Department of Anthropology, Brandeis University. Waltham.

Nagy, Murielle

1994a Fouilles archéologiques du site Pita (KcFr-5), Ivujivik, Nunavik (Nouveau-Québec). Version révisée, juin 1994. Rapport présenté au Ministère des Affaires culturelles du Québec. Québec. Unpublished.

1994b Fouilles de sauvetage du site Ohituk (KcFr-3), Ivujivik, Nunavik (Nouveau-Québec). Version révisée, décembre 1994. Rapport présenté au Ministère des Affaires culturelles du Québec. Québec. Unpublished.

1994c Interpretation in Arctic archaeology: Lessons from Inuvialuit oral history. In *Bridges across time: The NOGAP archaeology project,* edited by Jean-Luc Pilon, pp.29-38. Canadian Archaeological Association. Occasional Paper 2.

1995a Fouilles archéologiques des sites Mangiuk (KcFr-7) et Tivi Paningayak (KcFr-8), Ivujivik, Nunavik (Nouveau-Québec). Version révisée, janvier 1995. Rapport présenté au Ministère de la Culture et des Communications du Québec. Québec. Unpublished.

1995b Maps on the spatial distribution of lithic and organic tools from five Ivujivik sites. Unpublished manuscript in possession of the author.

1995c Statistical data on mircoblades from five Ivujivik sites. Unpublished manuscript in possession of the author.

Orquera, Luis Abel

1984 Specialization and the Middle/Upper Paleolithic transition. *Current Anthropology* 25(1):73-98.

Otte, Marcel

1990 From the Middle to the Upper Paleolithic: The nature of the transition. In *The emergence of modern humans: An archaeological perspective*, edited by Paul Mellars, pp.438-456. Edinburgh University Press. Edinburgh.

Owen, Linda R.

1984 *The microblades of Umingmak*. Urgeschichtliche Materialhefte 5.1. Tübingen.

1988 *Blade and microblade technology*. BAR International Series no. 441. Oxford.

Park, Robert W.

1989 Porden Point: An intra-site approach to settlement system analysis. Unpublished Ph.D. dissertation, Department of Anthropology, University of Alberta. Edmonton.

1992 Review of *Crossroads to Greenland: 3000 years of prehistory in the eastern High Arctic* by Peter Schledermann. *Canadian Journal of Archaeology* 16:121-122

Pintal, Jean-Yves

1994 A Groswater site at Blanc-Sablon, Quebec. In *Threads of Arctic prehistory: Papers in honour of William E. Taylor, Jr.*, edited by David Morrison and Jean-Luc Pilon, pp. 145-164. Canadian Museum of Civilization, Mercury series, Archaeological Survey of Canada, Paper 149. Hull.

Pitseolak, Peter and Dorothy Harley Eber

1993 *People from our side*. McGill-Queen's University Press. Montreal.

Plumet, Patrick

1978 Le Nouveau-Québec et le Labrador. *Recherches amérindiennes au Québec* 8(1):99-110.

1980 *Essai d'anayse descriptive: Les témoins façonnés pré-dorsétiens de Poste-de-la-Baleine, Québec (1975).* Laboratoire d'archéologie, Université du Québec à Montréal, Paléo-Québec no. 12.

1981 Matières premières allocthones et réseau spatial paléoesquimau en Ungava occidental, Arctique québécois. *Géographie physique et Quaternaire* 35(1):5-17

1982 Pour une revision du cadre conceptuel utilisé en préhistoire de l'Arctique central et oriental. *Etudes Inuit Studies* 6(1):130-139.

1985 *Archéologie de l'Ungava: Le site de la Pointe aux Bélougas (Qilalugarsiuvik) et les maisons longues dorsétiennes.* Laboratoire d'archéologie, Université du Québec à Montréal, Paléo-Québec no. 18.

1986 Questions et réflections concernant la préhistoire de l'Ungava. In *Palaeo-Eskimo cultures in Newfoundland, Labrador and Ungava.*, pp.151-160. Reports in Archaeology no. 1. Memorial University of Newfoundland. St. John's.

1987 Le développement de l'approche archéologique dans l'Arctique. *L'Anthropologie* 91(4):859-872.

1994 Le Paléoesquimau dans la baie du Diana (Arctique québécois). In *Threads of Arctic prehistory: Papers in honour of William E. Taylor, Jr.*, edited by David Morrison and Jean-Luc Pilon, pp. 145-164. Canadian Museum of Civilization, Mercury series, Archaeological Survey of Canada, Paper 149. Hull.

Plumet, Patrick and Pierre Gangloff

1991 *Contribution à l'archéologie et l'ethnohistoire de l'Ungava oriental. Côte est, Killiniq, îles Button, Labrador septentrional.* Presses de l'Université du Québec, Paléo-Québec no. 19.

Renouf, M.A.P.

1993 Palaeoeskimo seal hunters at Port au Choix, northwestern Newfoundland. *Newfoundland Studies* 9(2):185-212

1994 Two transitional sites at Port au Choix. In *Threads of Arctic prehistory: Papers in honour of William E. Taylor, Jr.*, edited by David Morrison and Jean-Luc Pilon, pp. 165-196. Canadian Museum of Civilization, Mercury series, Archaeological Survey of Canada, Paper 149. Hull.

Reynolds, Tim

1990 The Middle-Upper Palaeolithic transition in southwestern France: Interpreting the lithic evidence. In *The emergence of modern humans: An archaeological perspective*, edited by Paul Mellars, pp.261-275. Edinburgh University Press. Edinburgh.

Richard, Pierre

1981 *Paléophytogéographie postglaciaire en Ungava par l'analyse pollinique.* Laboratoire d'archéologie, Université du Québec à Montréal, Paléo-Québec no. 13.

Ridington, Robin
1994 Tools in the mind: Northern Athapaskan ecology, religion and technology. In *Circumpolar religion and ecology. An anthropology of the North*, edited by Takashi Irimoto and Takako Yamada, pp.273-288. University of Tokyo Press. Tokyo.

Ringrose, T.J.
1993 Bone counts and statistics: A critique. *Journal of Archaeological Science* 20:121-157.

Robertson, Ian G.
1988 Metric variability in Arctic Small Tool tradition spalled burins: A preliminary shaped analysis. Unpublished Master's thesis, Department of Archaeology, University of Calgary. Calgary.

Rousseau, Jacques
1968 The vegetation of the Québec-Labrador peninsula between 55° and 60° N. *Naturaliste canadien* 95(2):469-563.

Rowley, Susan
1985 Population movements in the Canadian Arctic. *Études Inuit Studies* 9(1):3-22.

Roy, Camille
1971a Le village esquimau d'Ivujivik et de sa région. Quelques aspects géographiques. Direction générale du Nouveau-Québec. 2 vols. Ministère des Richesses Naturelles du Québec, Québec.

1971b La chasse des mammifères marins chez les Ivujivimmiut. *Cahiers de Géographie.* 36:509-521.

Sackett, James R.
1986 Isochrestism and style: A clarification. *Journal of Anthropological Archaeology* 5:266-277.

Saladin d'Anglure, Bernard
1967 *L'organisation sociale traditionnelle des Esquimaux de Kangirsujuaaq*. Centre d'Études Nordiques, Travaux Divers no. 17.

Sandell, Hanne Tuborg and Birger Sandell
1991 Archaeology and environment in the Scoresby Sund fjord. Ethno-archaeological investigations of the last Thule culture of northeast Greenland. *Meddelelser om Grønland, Man and Society* no. 15.

Savelle, James M.
1987 *Collectors and foragers. Subsistence-settlement system change in the Central Canadian Arctic, A.D. 1000-1960.* BAR International Series no. 358. Oxford.

Schindler, Debra, L.
1985 Anthropology in the Arctic: A critique of racial typology and normative theory. *Current Anthropology* 26(4):475-499.

Schledermann, Peter
1990 *Crossroads to Greenland: 3000 years of prehistory in the eastern High Arctic.* The Arctic Institute of North America, Komatic Series no. 2. Calgary.

Simek, Jan and Heather A. Price
1990 Chronological change in Perigord lithic assemblage diversity. In *The emergence of modern humans: An archaeological perspective*, edited by Paul Mellars, pp.243-261. Edinburgh University Press. Edinburgh.

Smith, Thomas G.
1973 Population dynamics of the ringed seal in the Canadian Eastern Arctic. *Fisheries Research Board of Canada*, Bulletin 173.

Soffer, Olga
1989 The Middle to Upper Paleolithic transition on the Russian Plain. In *The Human revolution: Behavioural and biological perspectives on the origins of modern humans*, edited by Paul Mellars and Chris Stringer, pp.714-742. Edinburgh University Press. Edinburgh.

Speth, John D. and Katherine A. Spielmann
1983 Energy source, protein metabolism and hunter-gatherer subsistence strategies. *Journal of Anthropological Archaeology* 2:1-31.

Stefánsson, Vilhjámur
1914 Prehistoric and present commerce among the Arctic coast Eskimo. *Geological Survey of Canada, Museum Bulletin 6, Anthropological Series 3*. Ottawa.

1919 The Stefánsson-Anderson Arctic expedition of the American Museum: Preliminary ethnological report. *Anthropological Papers of the American Museum of Natural History 14(1)*. New York.

Stenton, Douglas, R.
1983 An analysis of faunal remains from the Peale Point site (KkDo-1), Baffin Island, NWT. Unpublished Master's thesis. Department of Anthropology, Trent University. Peterborough.

1989 Terrestrial adaptations of Neo-Eskimo coastal-marine hunters on southern Baffin Island, N.W.T. Unpublished Ph.D. dissertation, Department of Anthropology, University of Alberta, Edmonton.

Stirling, I. and E.H. McEwan
1975 The caloric value of whole ringed seals (*Phoca hispida*) in relation to polar bear (*Ursus maritimus*) ecology and hunting behavior. *Canadian Journal of Zoology* 53:1021-1027.

Stockwell, C.H., J.C. McGlynn, R.F. Emslie, B.V. Stanford, A.W. Norris, J.A. Donaldson, W.F. Fahrig and K.L. Currie.
1972 Geology of the Canadian Shield. In *Geology and economic minerals of Canada*, edited by R.J.W. Douglas, pp.43-150. Geological Survey of Canada, Economy Geology, Report no. 1, Department of Energy, Mines and Resources. Ottawa.

Stuiver, M. and B. Becker
1986 High precision decadal calibration of the radiocarbon time scale A.D. 1950-2500 B.C. *Radiocarbon* 28 (2B):863-910.

Taylor, R.E.
1987 *Radiocarbon dating: An archaeological perspective*. Academic Press. Orlando.

Taylor, William E. Jr
1958 Archaeological work in Ungava, 1957. *Arctic Circular* 10:25-27.

1959a Archaeological work in Ungava and Mansel Island. *Arctic Circular*. 11(4):66-68.

1959b Review and assessment of the Dorset problem. *Anthropologica, N.S.* 1(102):24-26.

1960 Archaeological work, Ivugivik and Mansel Island. *Arctic Circular* 13(1):1-4.

1962a Pre-Dorset occupations at Ivugivik in northwestern Ungava. In *Prehistoric cultural relation between the Arctic and the temperate zone of North America,* edited by John M. Campbell, pp.80-91. The Arctic Institute of North America, Technical Paper no. 11. Montreal.

1962b A distinction between blades and microblades in the American Arctic. *American Antiquity* 27(3):425-426.

1964 La préhistoire de la péninsule du Labrador. Musée National du Canada. *Études anthropologiques,* no. 7.

1968 *The Arnapik and Tyara sites: An archaeological study of Dorset culture origins.* Memoirs of the Society for American Archaeology, Paper no. 22.

Taylor, William E. Jr and Robert McGhee
1979 *Archaeological material from Creswell Bay, N.W.T., Canada.* National Museum of Man, Mercury Series, Archaeological Survey of Canada, Paper 85. Ottawa.

Thornton, Meg
1996 The effects of rodent gnawing on faunal materials. Paper presented at the 23rd Annual meeting of the Alaska Anthropological Association. Fairbanks.

Torrence, Robin
1989 Tools as optimal solutions. In *Time, energy and stone tools,* edited by Robin Torrence, pp. 1-6. Cambridge University Press. Cambridge.

Trigger, Bruce
1991 Constraints and freedom - A new synthesis for archaeological explanation. *American Anthropologist* 93:551-568.

Trinkaus, Erik
1989 The Upper Pleistocene transition. In *The emergence of modern humans: Biocultural adaptation in the later Pleistocene*, edited by Erik Trinkaus, pp.42-66. Cambridge University Press. Cambridge.

Tuck, James A.
1975 *Prehistory of Saglek Bay, Labrador: Archaic and Palaeo-Eskimo occupations.* National Museum of Man, Mercury Series, Archaeological Survey of Canada, Paper 32. Ottawa.

1976 Paleoeskimo cultures of northern Labrador. In *Eastern Arctic prehistory: Paleoeskimo problems*, edited by Moreau S. Maxwell, pp.89-102. Memoirs of the Society for American Archaeology. Paper 31.

Tuck, James A. and William Fitzhugh
1986 Palaeo-Eskimo traditions of Newfoundland and Labrador: A re-appraisal. In *Palaeo-Eskimo cultures in Newfoundland, Labrador and Ungava*, pp.161-168. Reports in Archaeology no. 1, Memorial University of Newfoundland. St. John's.

Tuck, James and Robert McGhee
1983 Sea mammals dates: Science or science fiction? *Quarterly Review of Archaeology* 4(2):9-10.

Tuck, James A. and Peter G. Ramsden
1990 Continuities in Paleoeskimo prehistory. Paper presented at the 23rd Annual Meeting of the Canadian Archaeological Association. Whitehorse.

Tuck, Leslie M.
1965 *Les marmettes: Leur répartition, leurs populations et leurs particularités biologiques. Étude du genre* Uria. Service canadien de la faune, Division des Parcs Nationaux, Série Faune du Canada no. 1. Ministère du nord canadien et ressources nationales. Ottawa.

Van der Leeuw, Sander E.
1989 Risk, perception and innovation. In *What's New ? A Closer Look at the Process of Innovation,* edited by S.A. Van der Leeuw and R. Torrence, pp.300-329. One World Archaeology no. 14, Unwin Hyman. London.

Van der Velde, Frans
1956 Les règles du partage des phoques pris par la chasse aux aglus. *Anthropologica* 3:5-15.

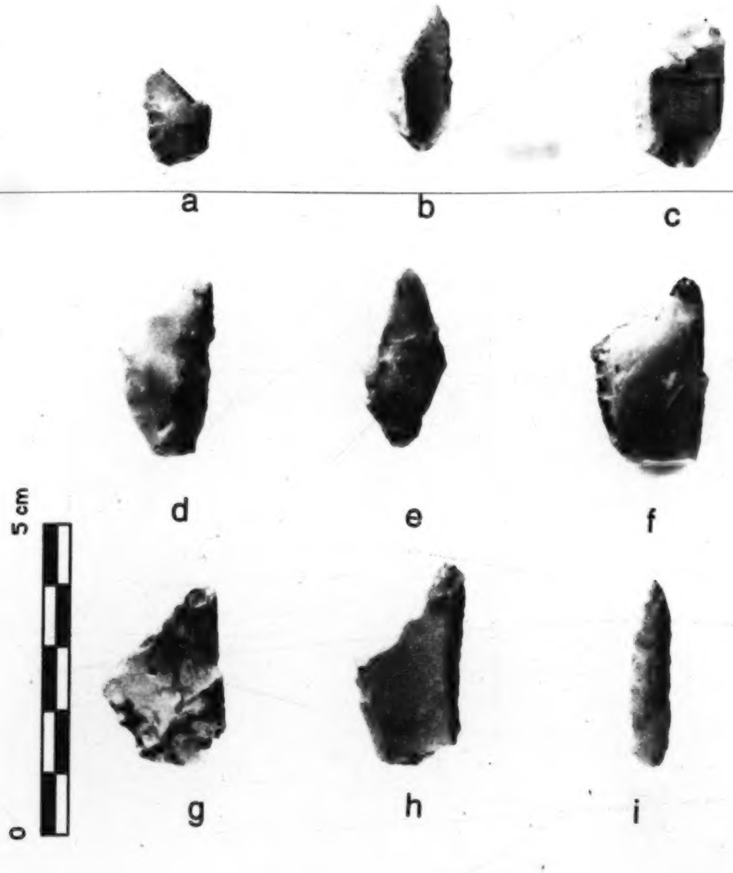
Vézinet, Monique
1980 *Les Nunamiut. Inuit au coeur des terres*. Civilisation du Québec. Québec.

Victor, Paul-Émile and Joëlle Robert-Lamblin
1989 *La civilisation du phoque. Jeux, gestes et techniques des Eskimo d'Ammassalik.* Armand Colin et Raymond Chabaud éditeurs. Bourges.

White, Randall
1982 Rethinking the Middle/Upper Paleolithic transition. *Current Anthropology* 23(2):169-192.

Zvelebil, Marek II
1986 Mesolithic prelude and Neolithic revolution. In *Hunters in transition: Mesolithic societies of temperate Eurasia and their transition to farming,* edited by Marek II Zvelebil, pp.5-16. Cambridge University Press. Cambridge.

PLATES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i
5 cm
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Plate 1. Mangiuk site, northeast area (KcFr-7NE): Burins

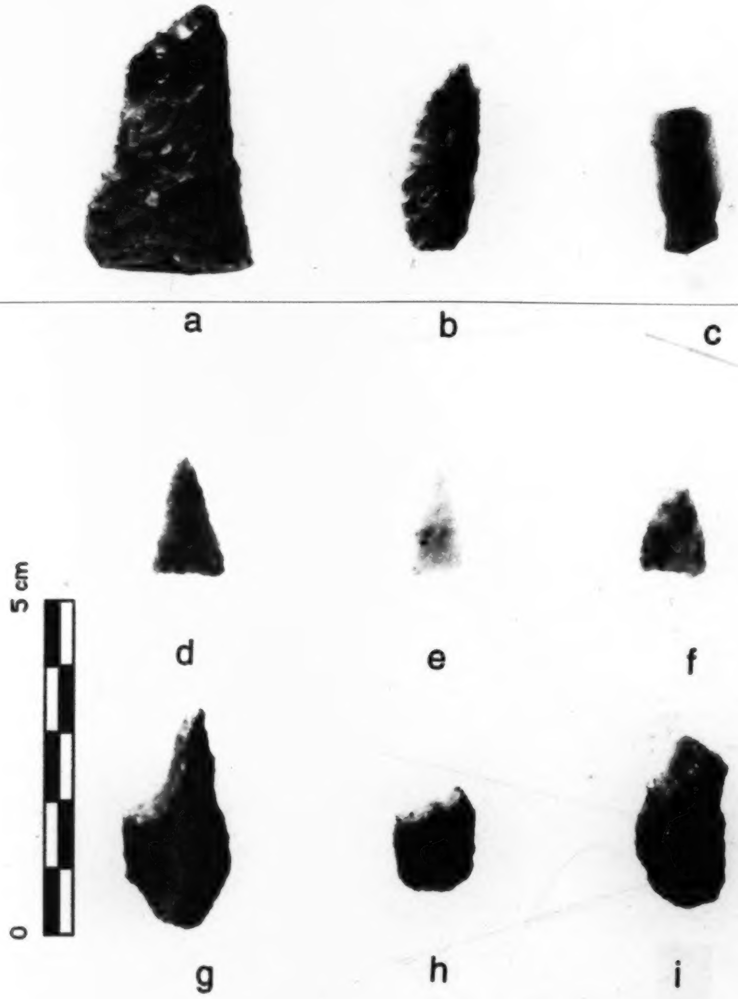
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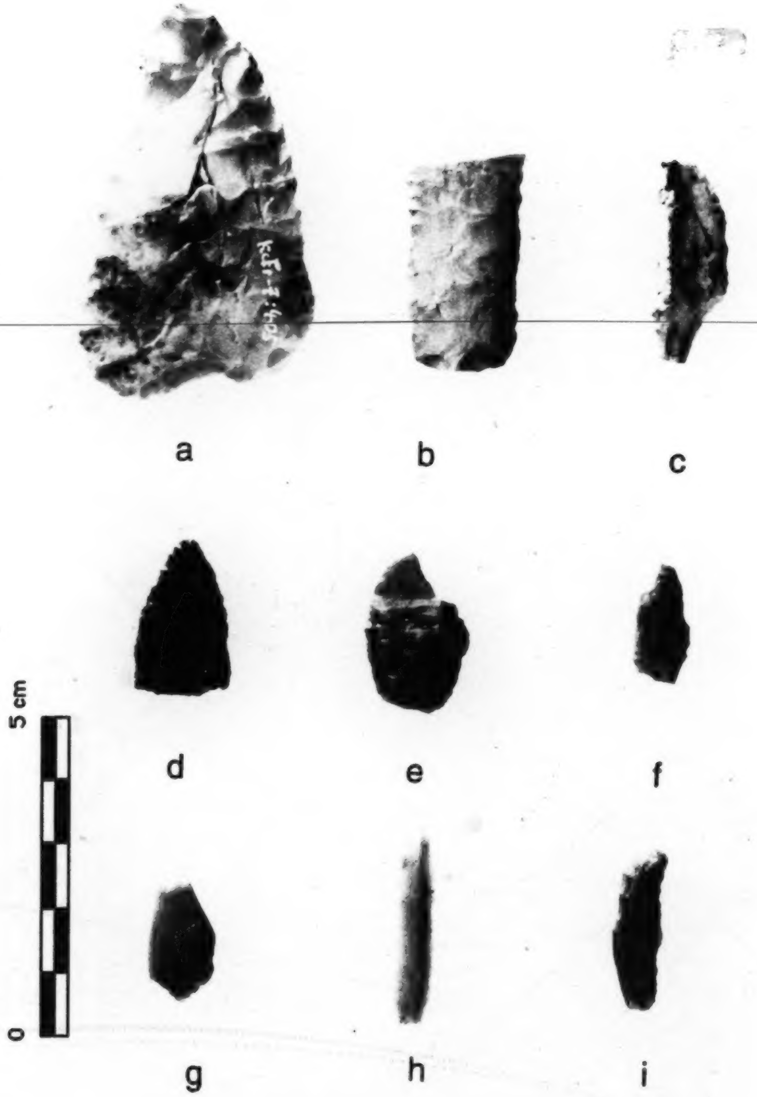
Plate 2. Mangiuk site, northeast area (KcFr-7NE): Burin (i), endblades (d-f), graver (h), knife (a), microblade (c) and sideblade (b)


KcFr-7:405
a
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c
5 cm
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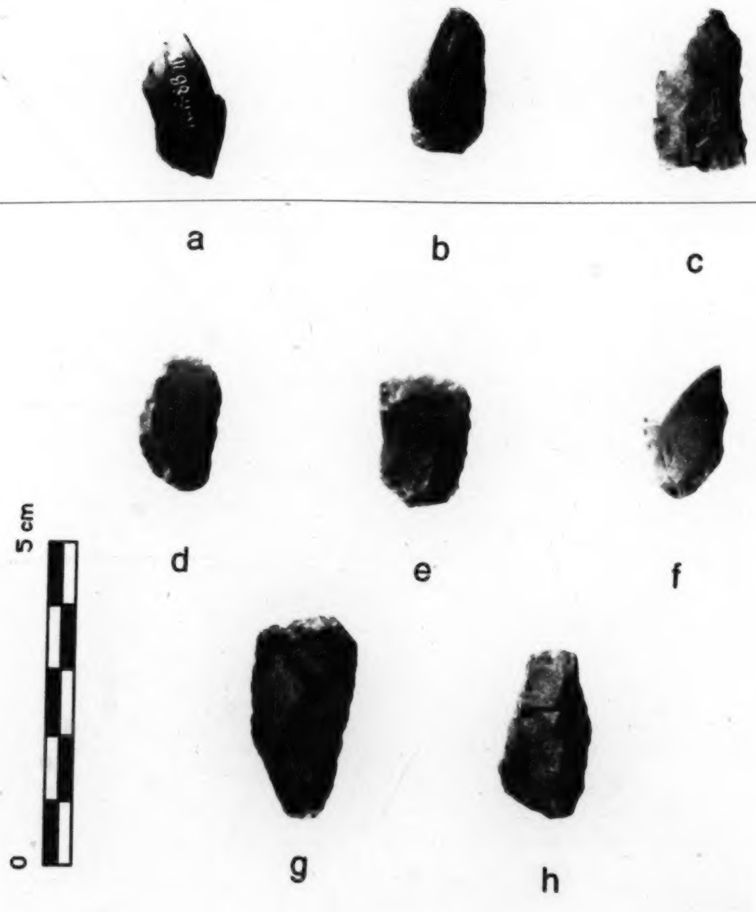
Plate 3. Mangiuk site, north area (KcFr-7N): Burins (e-g), endblade (d), knives (a-c) and microblades (h-i)


a
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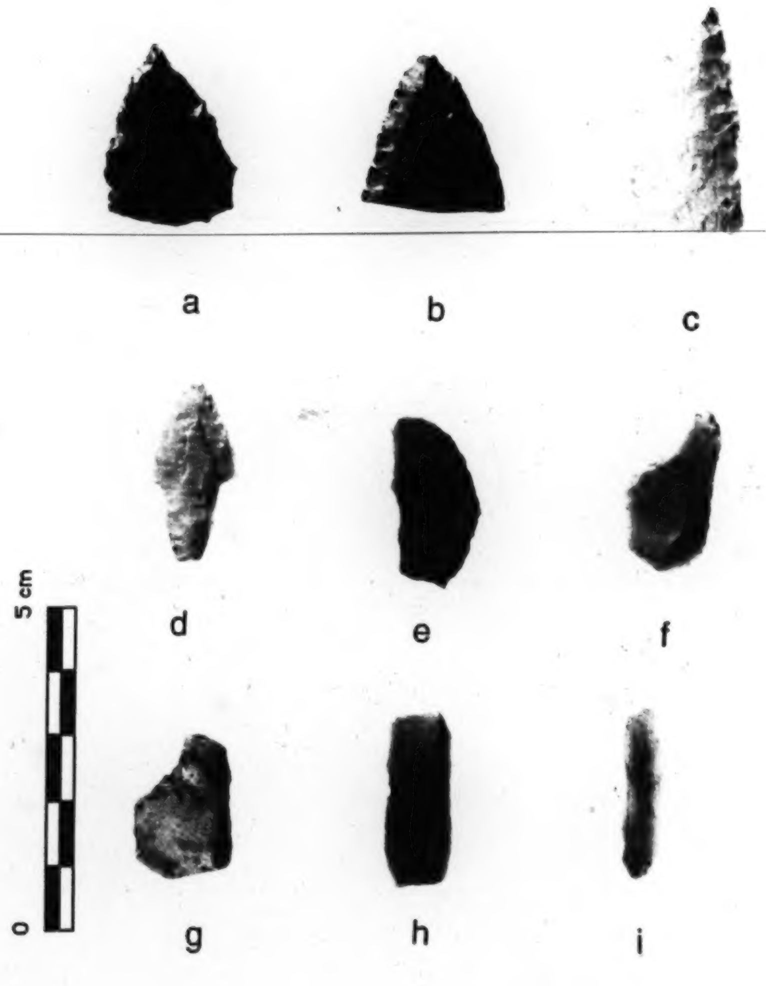
g
h

Plate 4. Tivi Paningayak site, area B (KcFr-8B): Burins


a
b
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e
f
5 cm
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g
h
i

Plate 5. Tivi Paningayak site, area B (KcFr-8B): Burins (f-g), endblades (a-b, d), knives (c, e) and microblades (h-i)

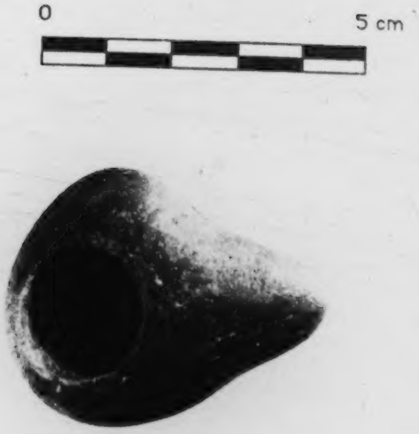
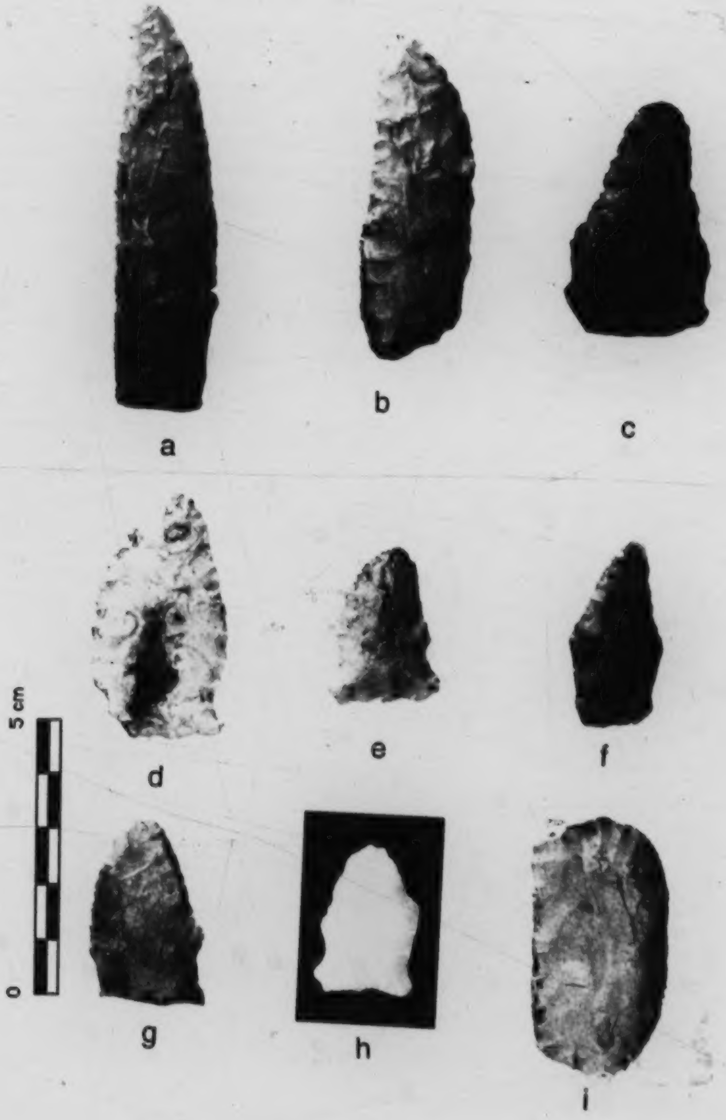


Plate 6. Tivi Paningayak site, area B (KcFr-8B): Manuport found in structure BB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d
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f
g
h
i
5 cm
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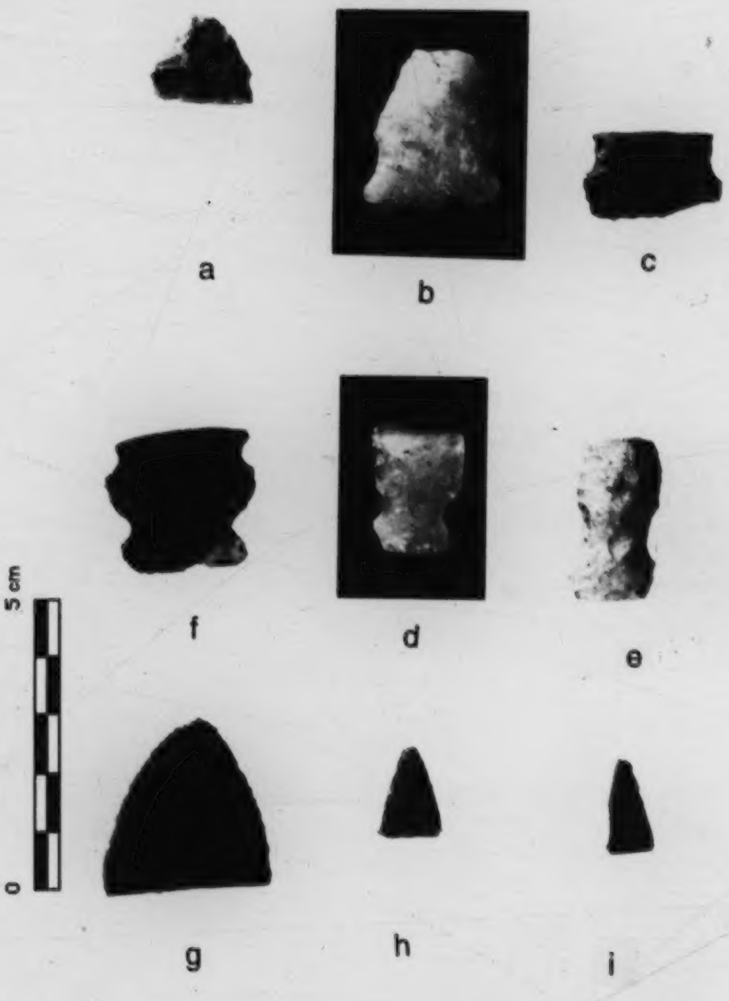
Plate 7. Pita site (KcFr-5): Knives


a
b
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e
5 cm
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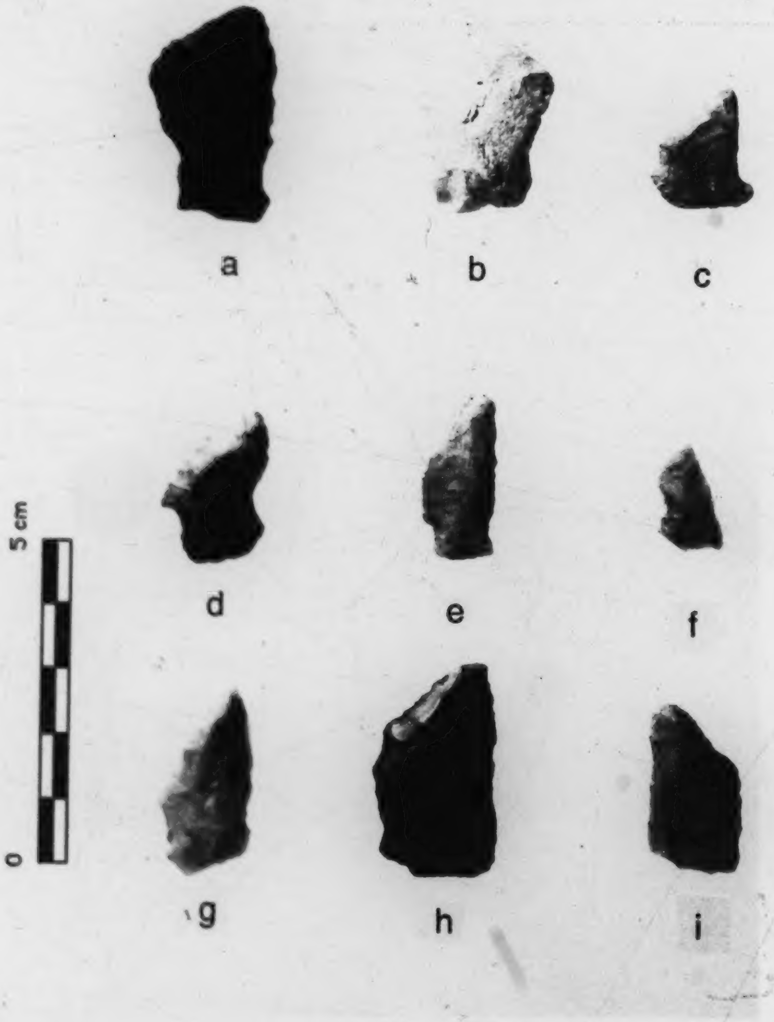
g
h
i

Plate 8. Pita site (KcFr-5): Endblades (h), knives (a-g) and tip-fluted spall (i)


a
b
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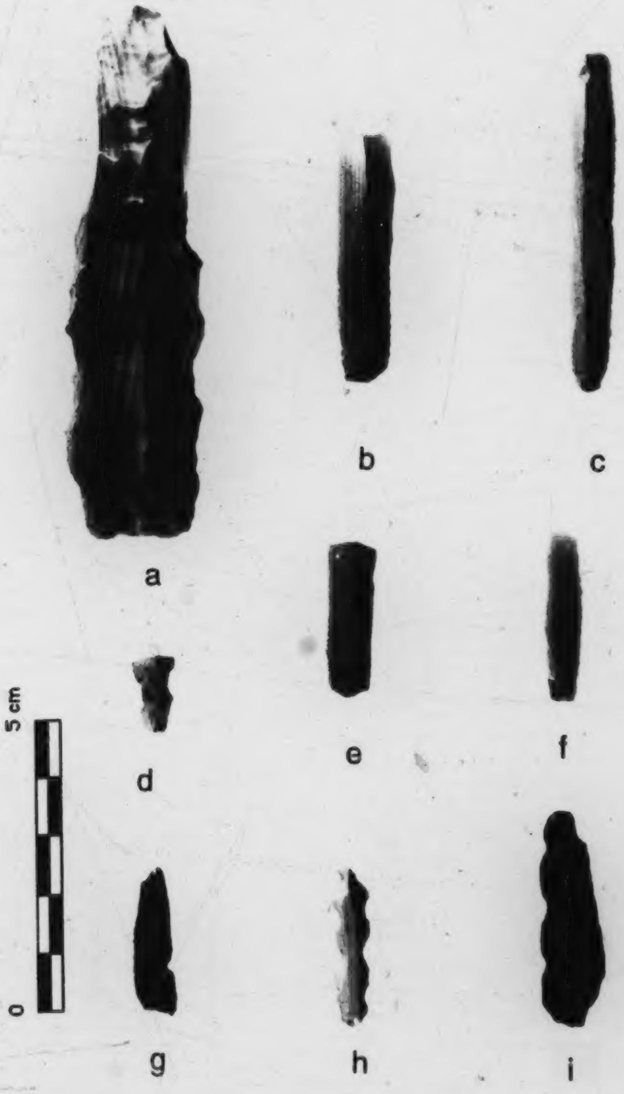
e
f
g
h
i
5 cm
0

Plate 9. Pita site (KcFr-5): Transverse-edged knives (a-g) and transverse-edged sidescrapers (h-i)


a
b
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i
5 cm
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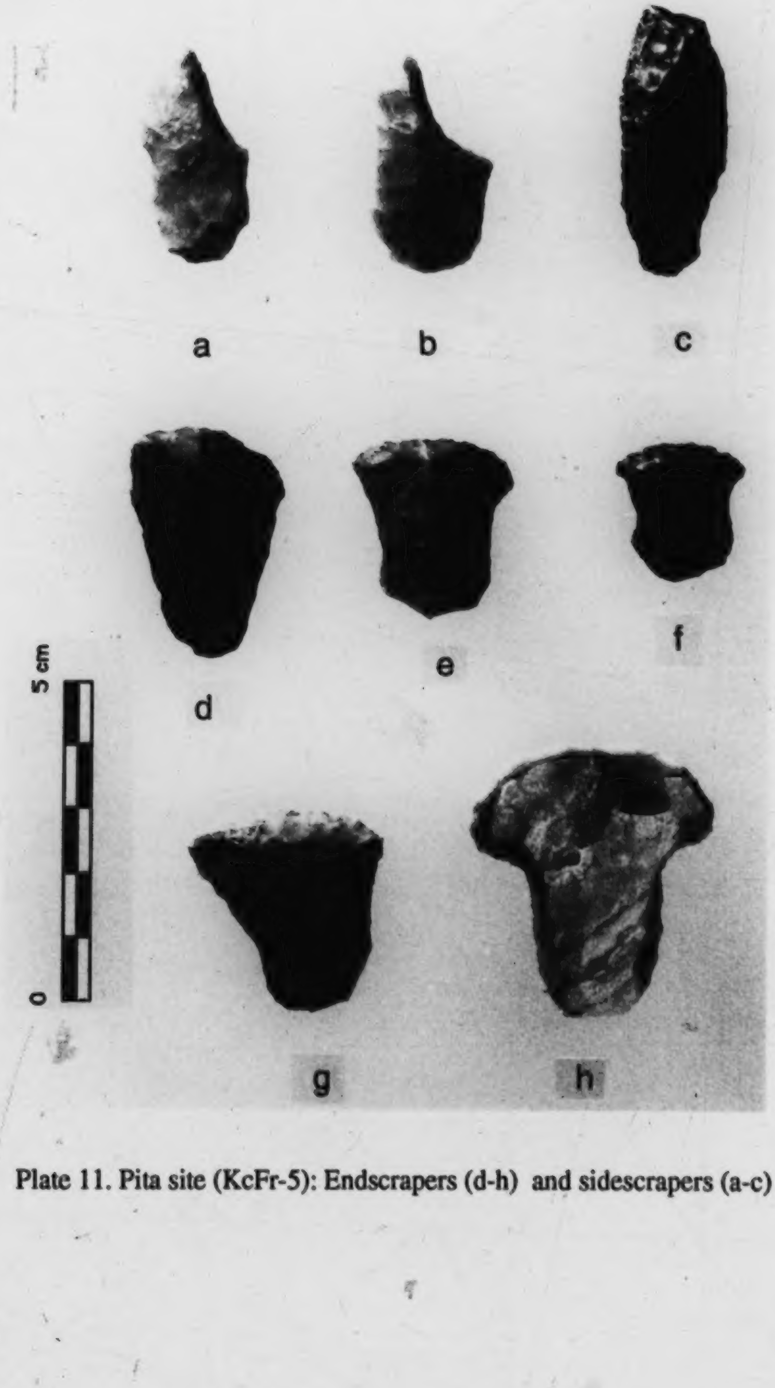
Plate 10. Pita site (KcFr-5): Microblade core (a), microblades (b-h) and steatite object (i)


a
b
c
d
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f
5 cm
0
g
h

Plate 11. Pita site (KcFr-5): Endscrapers (d-h) and sidescrapers (a-c)

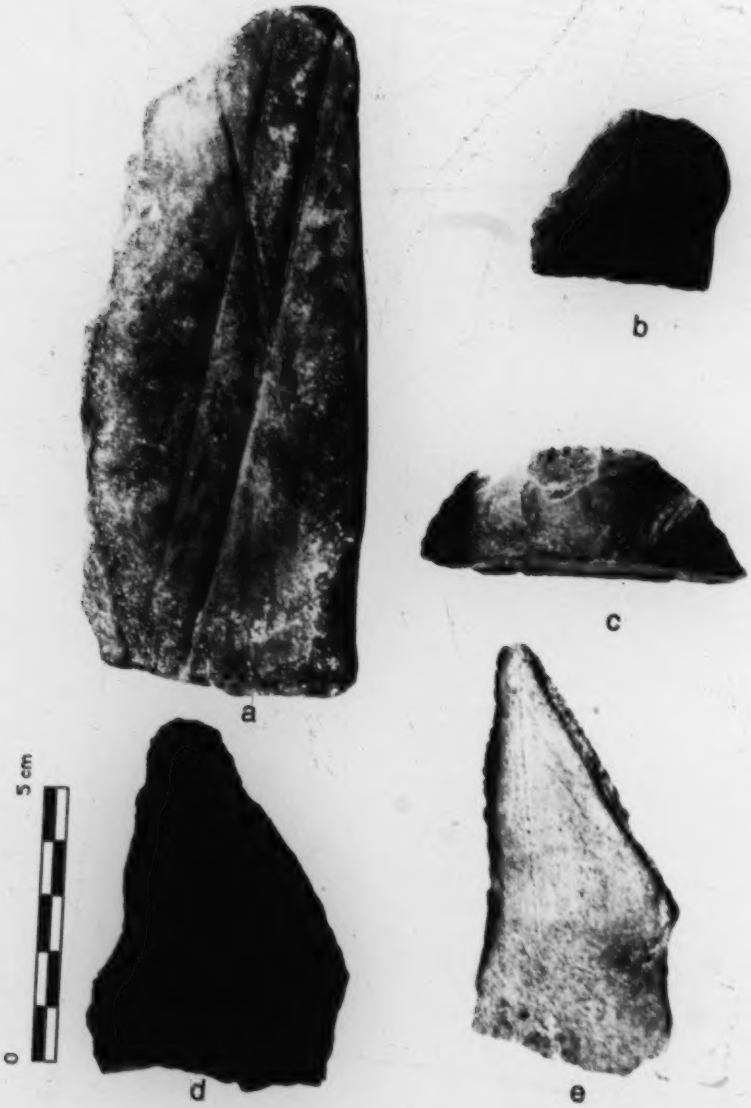


Plate 12. Pita site (KcFr-5): Abrader for needles (b), biface (c), knife (e), and sharpeners for burin-like tools (a, d)

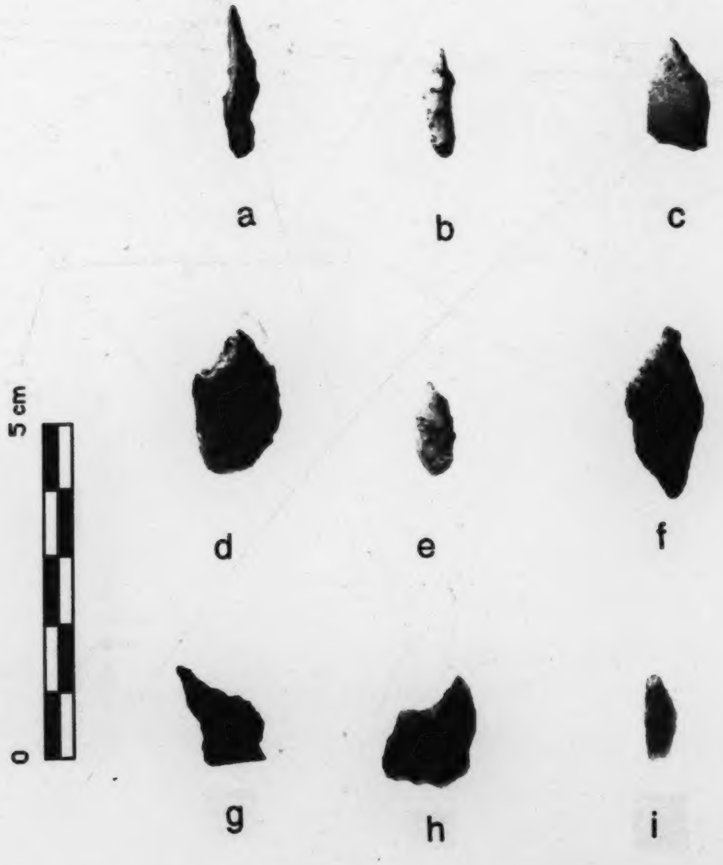

a
b
c
5 cm
d
e
f
0
g
h
i

Plate 13. Pita site (KcFr-5): Drills (a, i) and gravers (b-h)

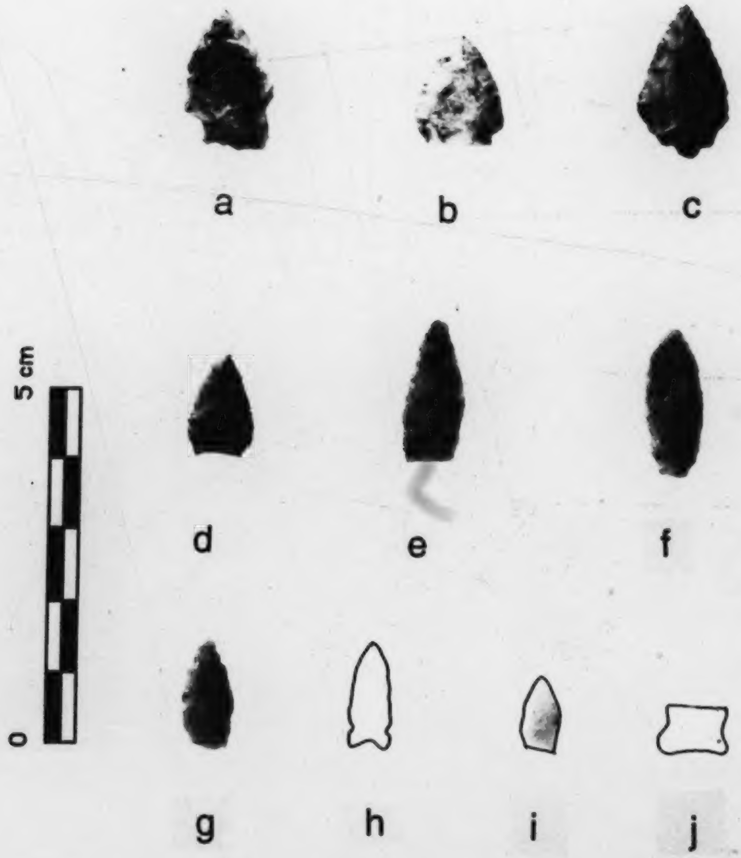
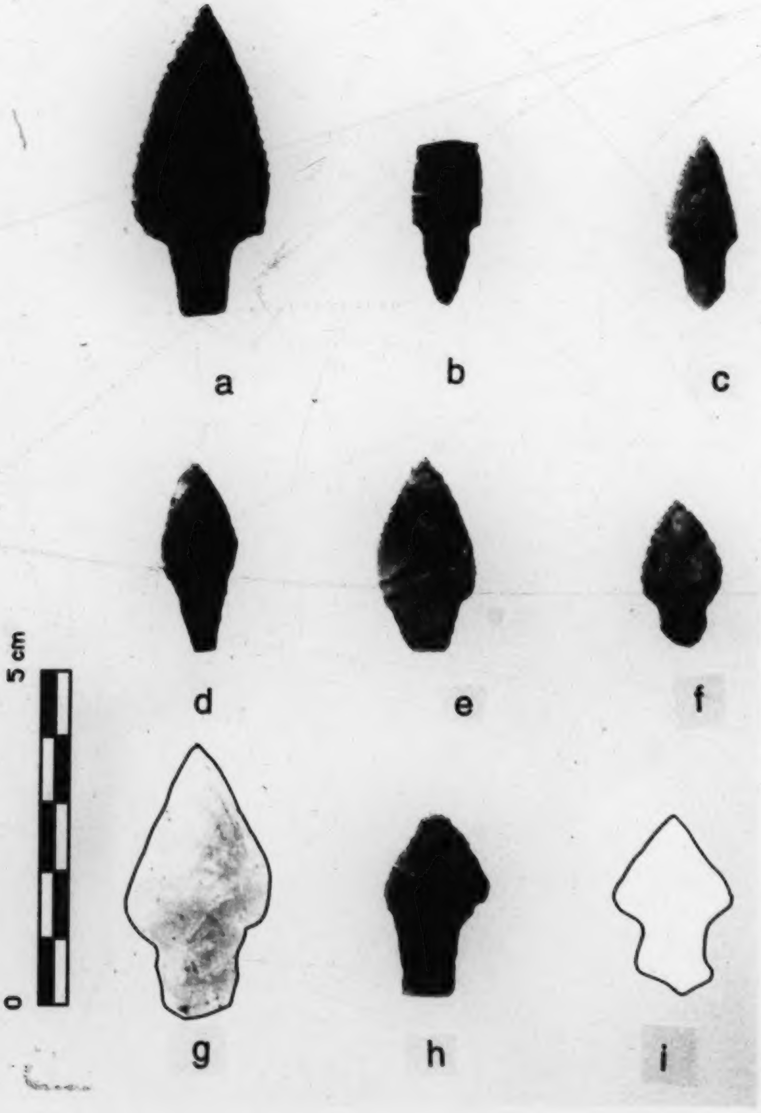

5 cm
0
a
b
c
d
e
f
g
h
i
j

Plate 14. Pita site (KcFr-5): Endblades


a
b
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d
e
f
g
h
i
5 cm
0

Plate 15. Pita site (KcFr-5): Endblades

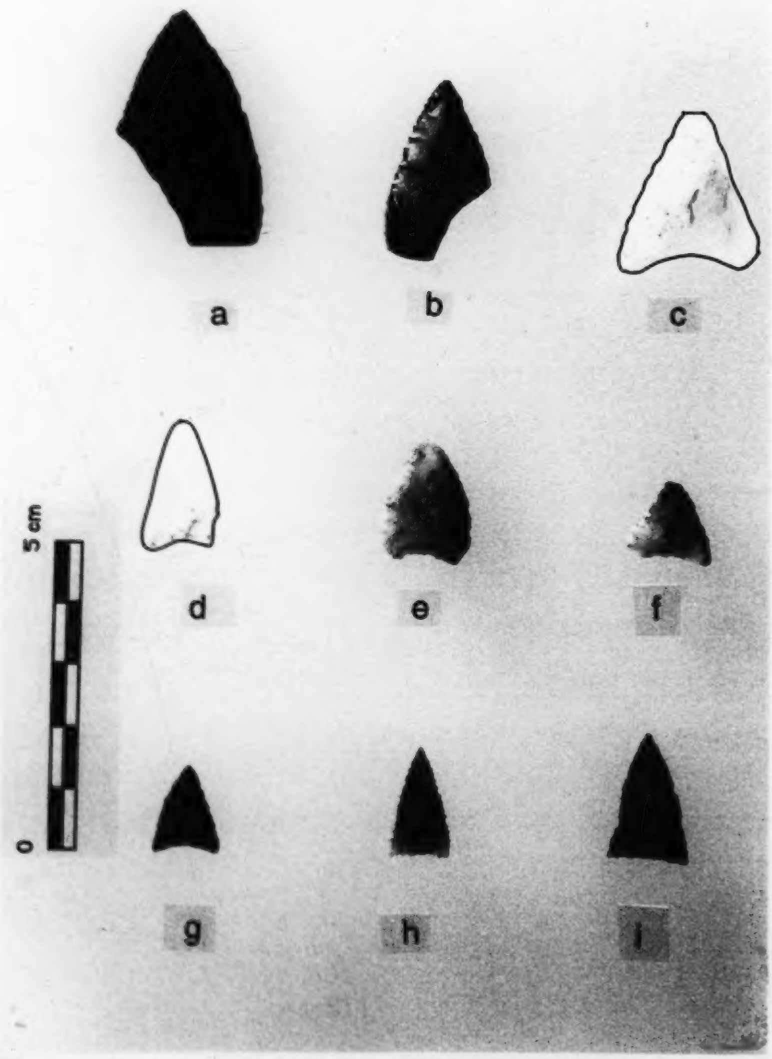

a
b
c
d
e
f
5 cm
0
g
h
i

Plate16. Pita site (KcFr-5): Endblades

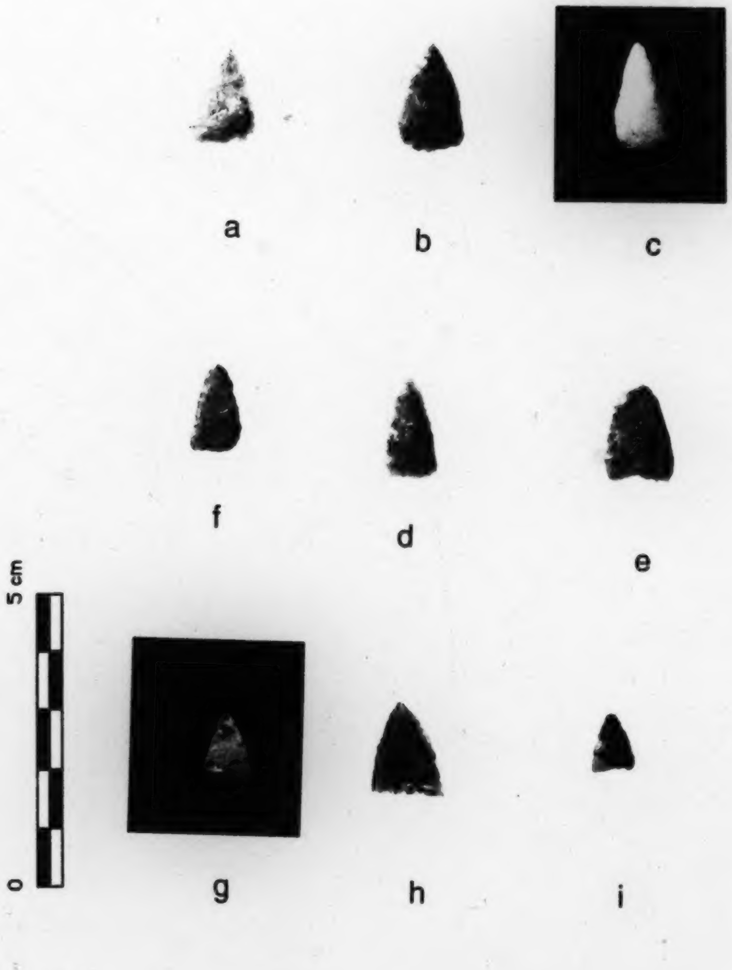

a
b
c
f
d
e
5 cm
0
g
h
i

Plate 17. Pita site (KcFr-5): Endblades

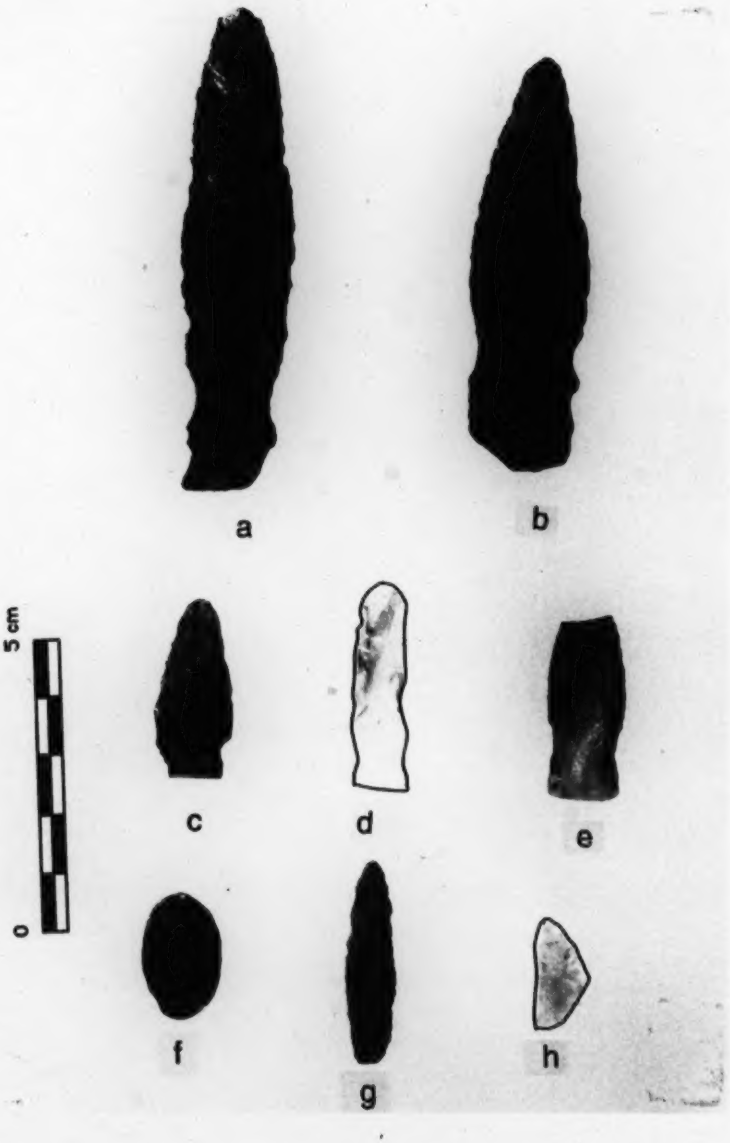
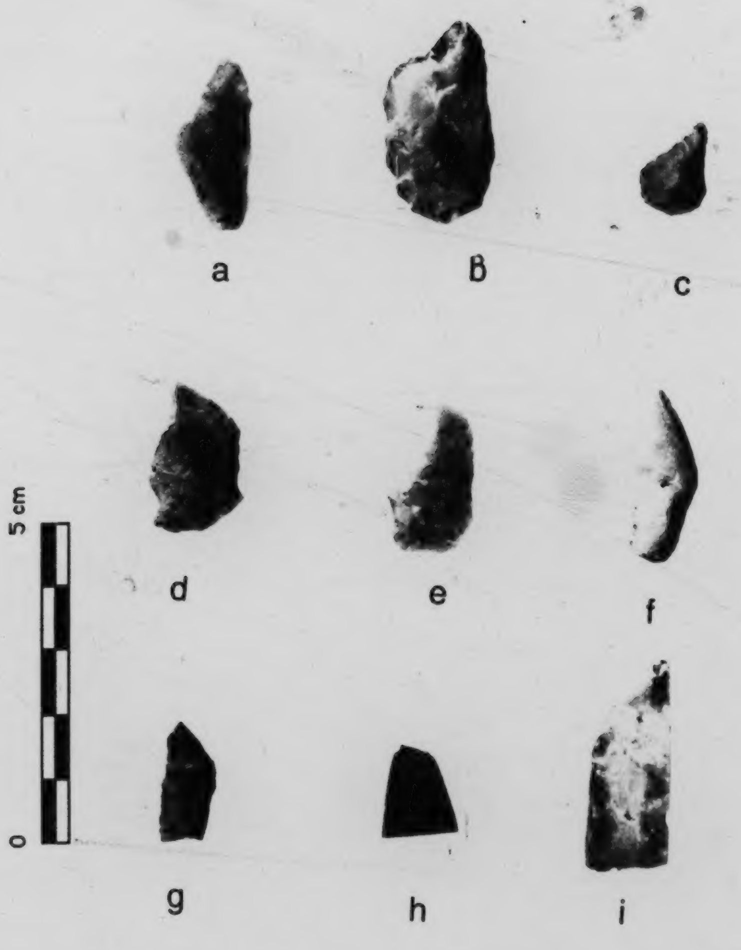

a
b
5 cm
0
c
d
e
f
g
h

Plate 18. Pita site (KcFr-5): Endblades (a, b, d, f, g), knife (c) and sideblades (e, h)

Plate 19. Pita site (KcFr-5): Bifaces


a
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i
5 cm
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Plate 20. Pita site (KcFr-5): Burins (a-g) and burin-like tools (h-i)

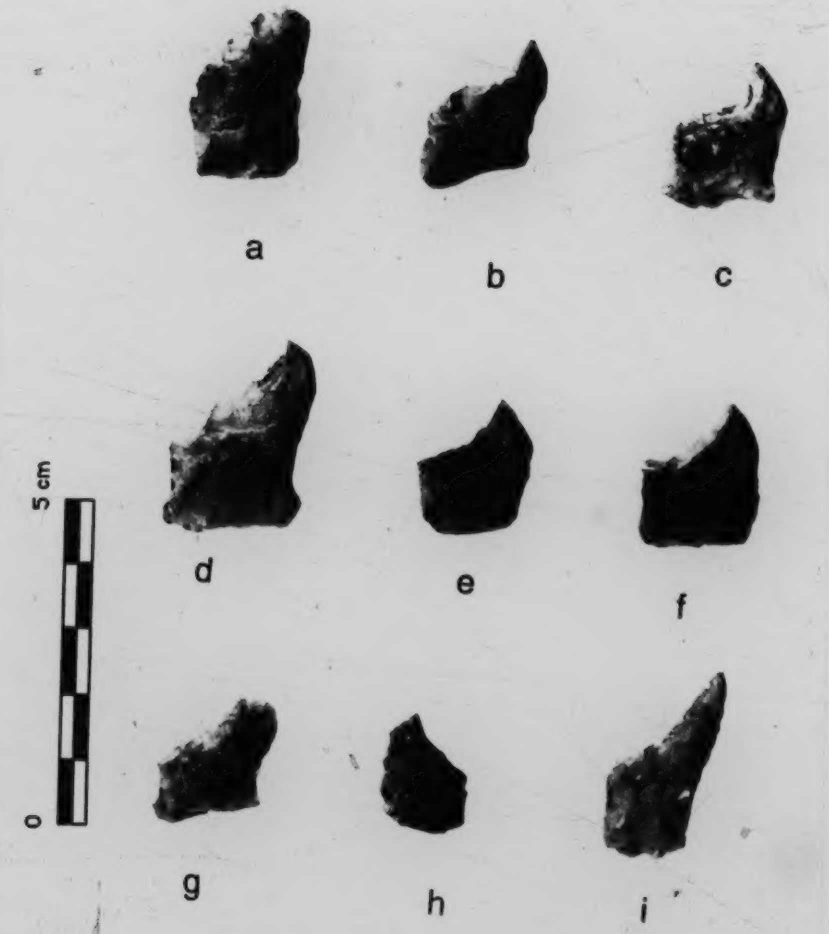

a
b
c
d
e
f
g
h
i
5 cm
0

Plate 21. Pita site (KcFr-5): Burins

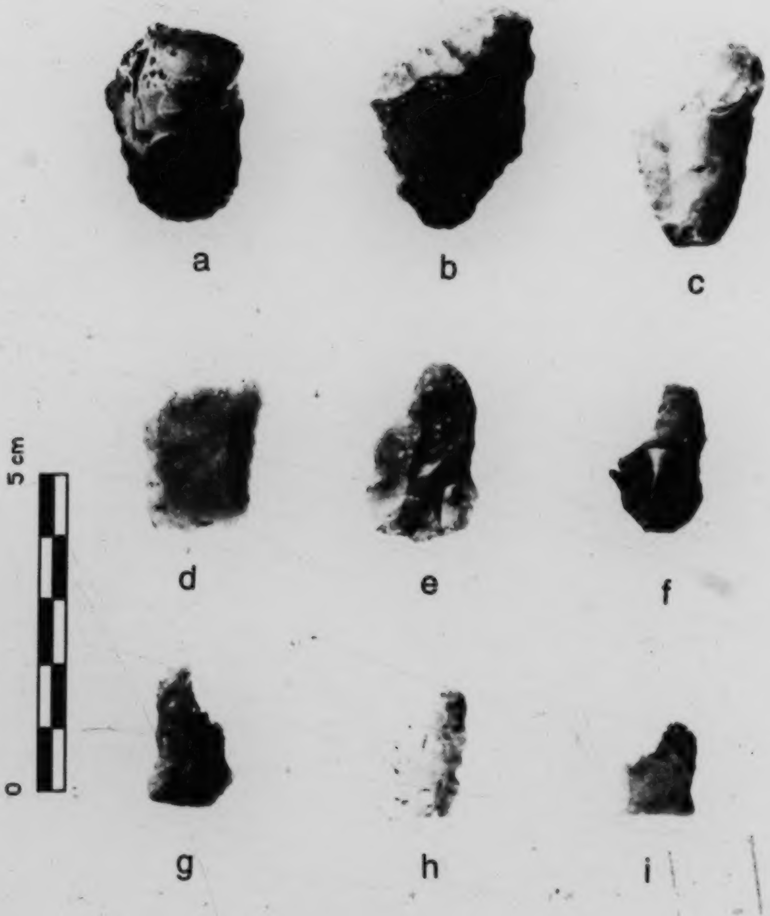

a
b
c
d
e
f
g
h
i
5 cm
0

Plate 22. Pita site (KcFr-5): Burins

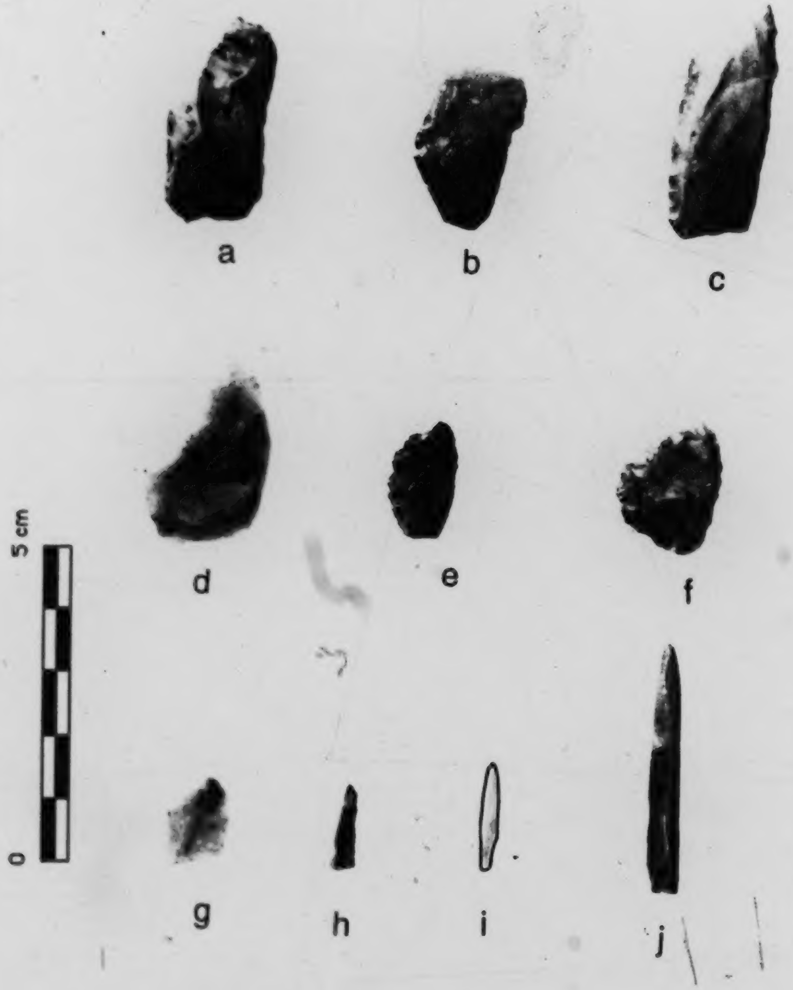

a
b
c
d
e
f
g
h
i
j
5 cm
0

Plate 23. Pita site (KcFr-5): Burins (a-g) and burin spalls (h-i)

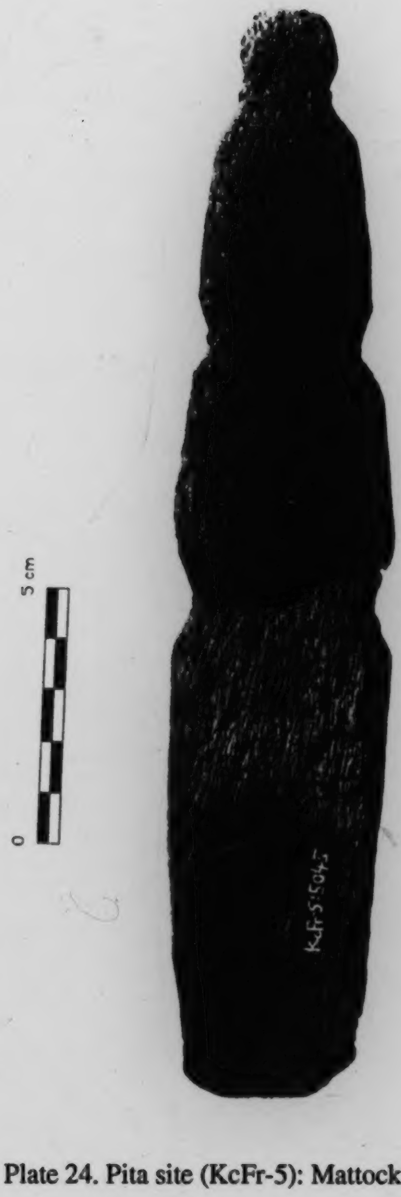

5 cm
0
KcFr-5:504.5

Plate 24. Pita site (KcFr-5): Mattock blade

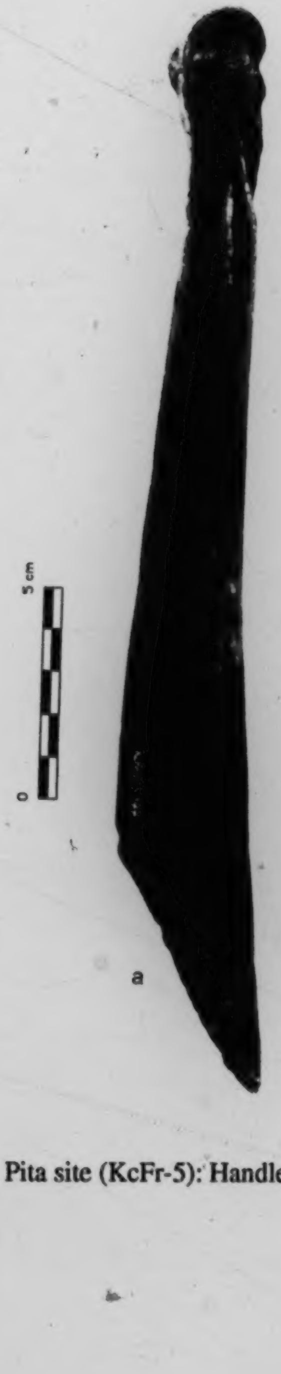


Plate 25. Pita site (KcFr-5): Handle (b) and scraper (a)

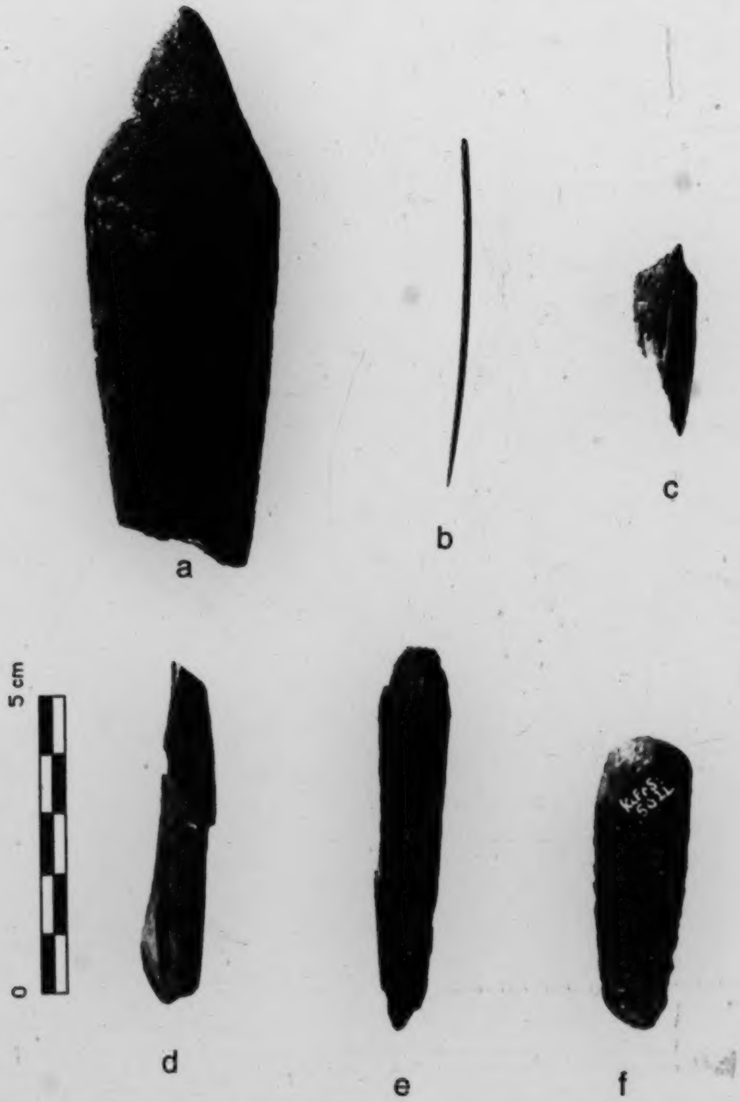


Plate 26. Pita site (KcFr-5): Miscellaneous organic artifacts; handle (a), needle (b), engraved fragment (c), harpoon fragment (d), shaft (e) and plug (f)

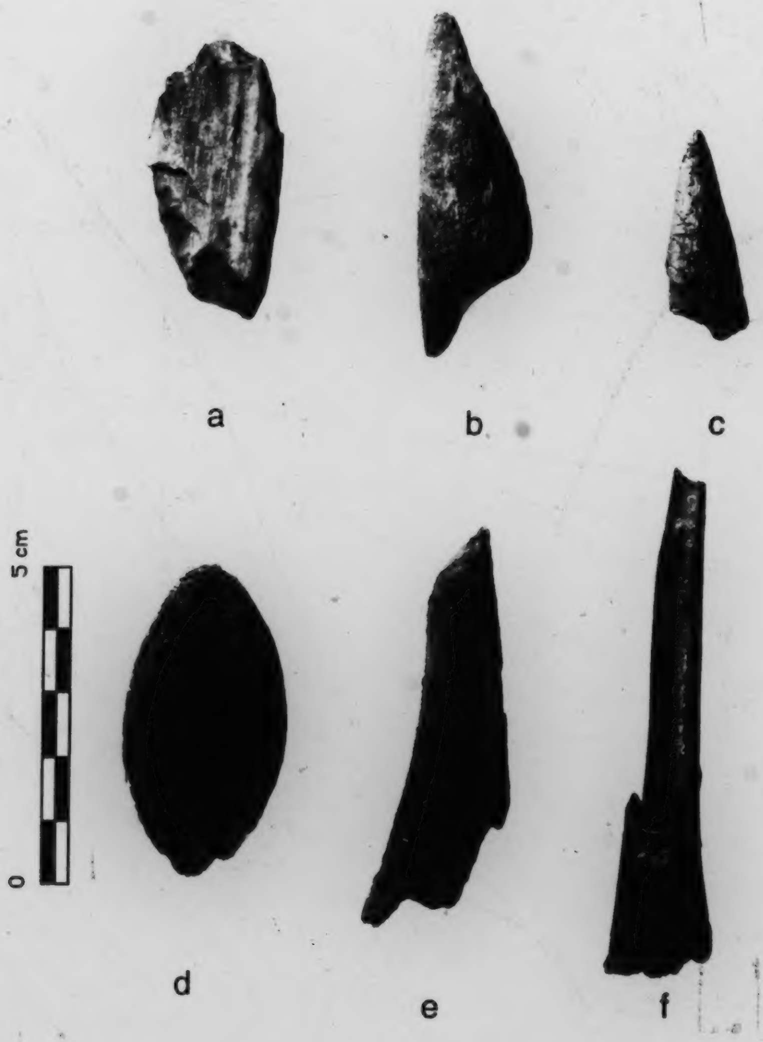


Plate 27. Pita site (KcFr-5): Miscellaneous organic artifacts; flake (a), harpoon preform (b), harpoon fragment (c), circular/flat object (d), blank (e-f)

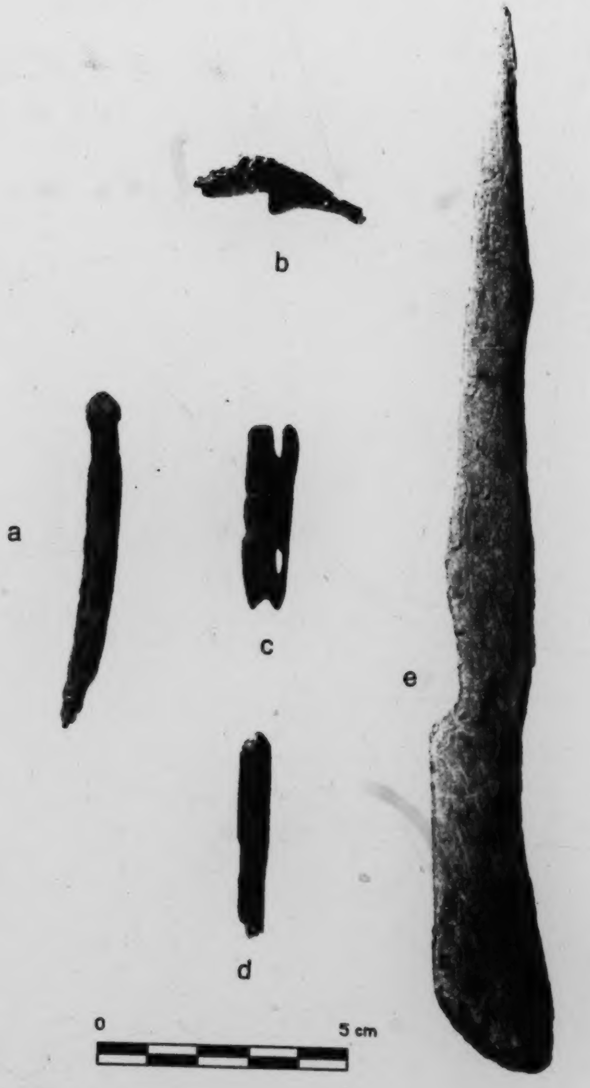


Plate 28. Pita site (KcFr-5): Miscellaneous organic artifacts; unid. tool (a, d), polar bear carving (b) and harpoon fragment (c). Ohituk site (KcFr-3A): Knife (e)

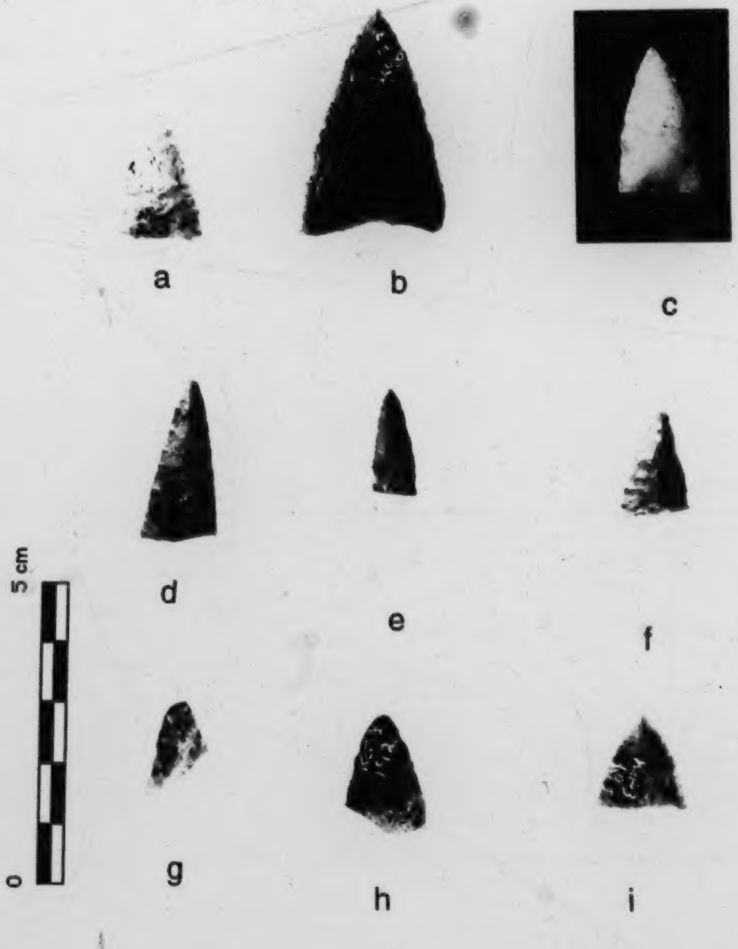

a
b
c
d
e
f
g
h
i
5 cm
0

Plate 29. Ohituk site (KcFr-3A): Endblades

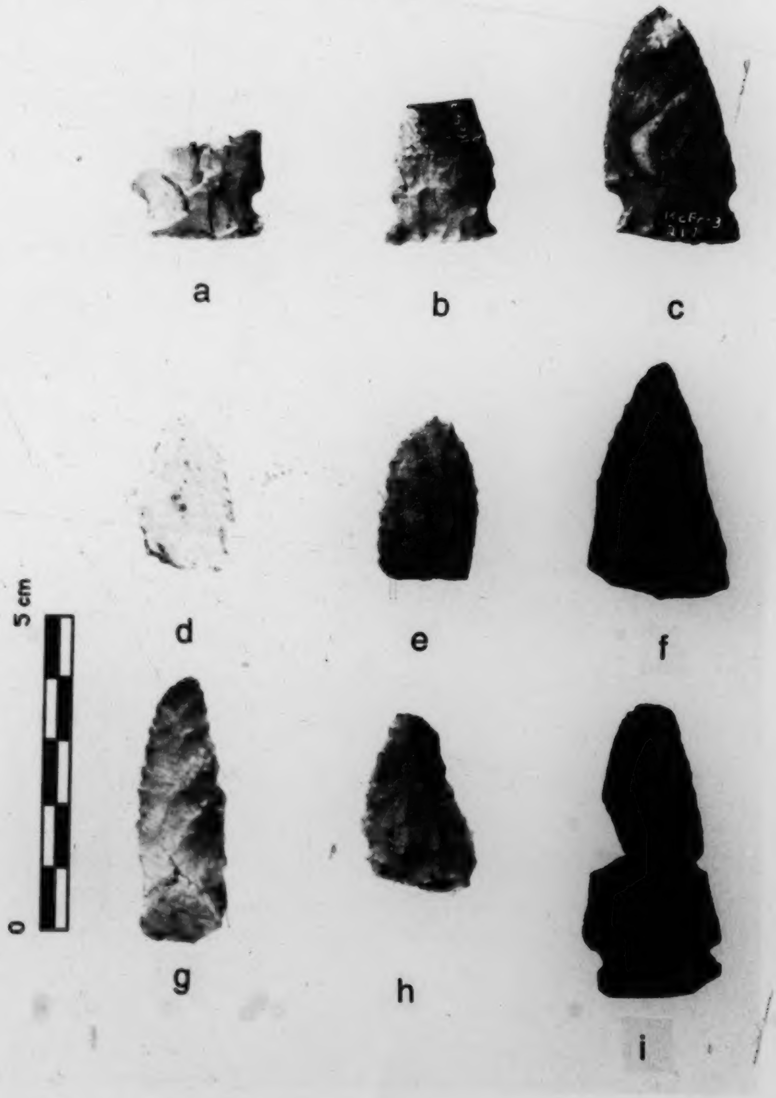

a
b
c
5 cm
0
d
e
f
g
h
i

Plate 30. Ohituk site (KcFr-3A): Knives

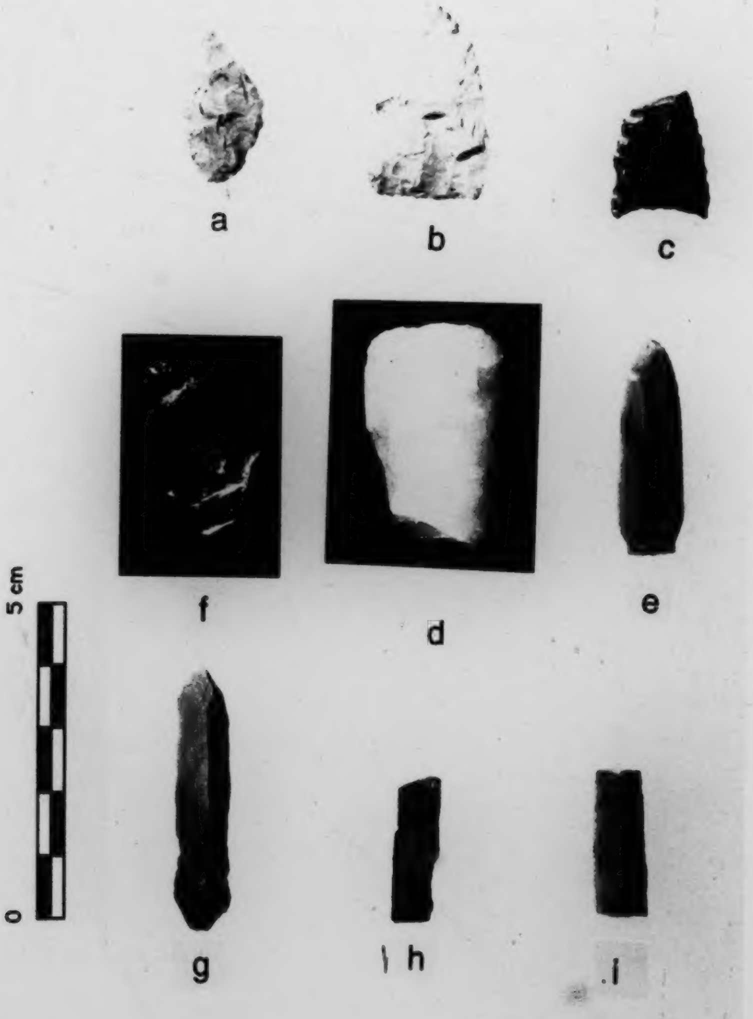

a
b
c
f
d
e
5 cm
0
g
h
i

Plate 31. Ohituk site (KcFr-3A): Endblades (b-c), endscraper (d), knife (f), microblades (e-i) and sideblade (a)

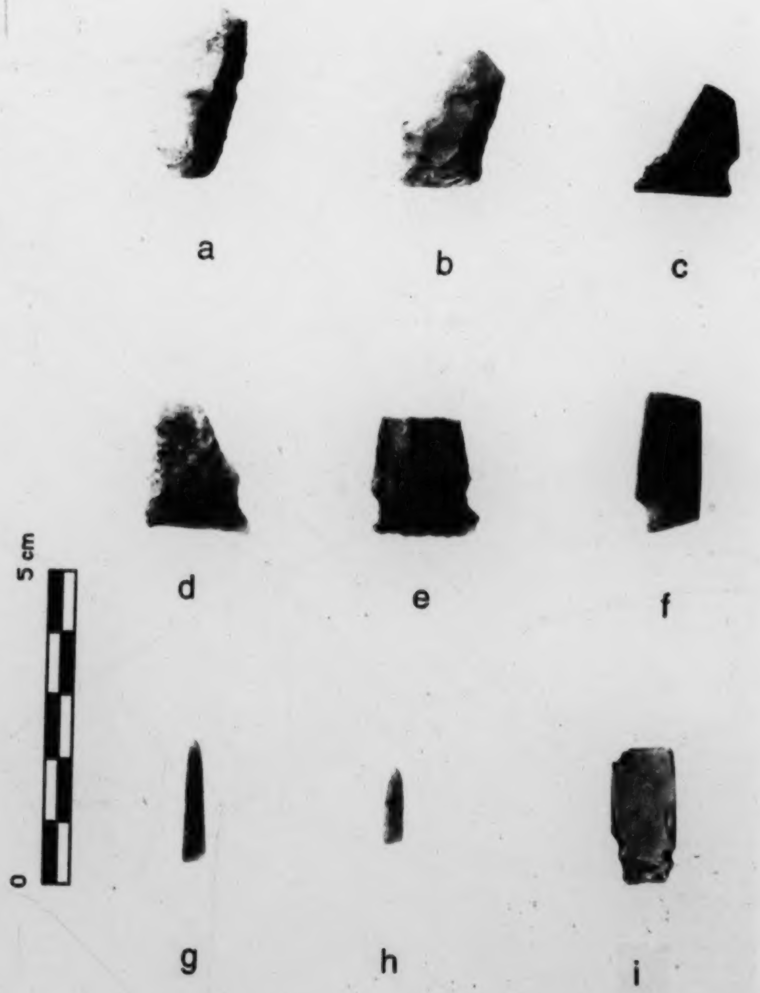

a
b
c
d
e
f
5 cm
0
g
h
i

Plate 32. Ohituk site (KcFr-3A): Burins (a-d), burin-like tools (e-f, i), and burin spalls (g-h)

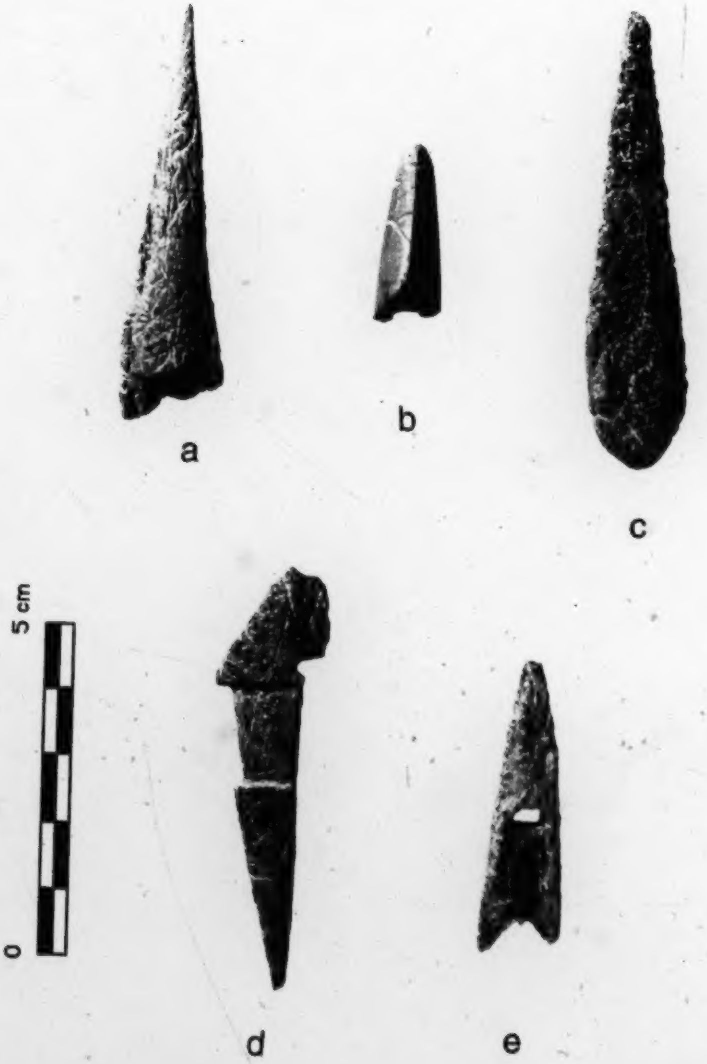


Plate 33. Ohituk site (KcFr-3A): Miscellaneous organic artifacts; awl (a), flaking punch (c), harpoon fragments (b, d) and harpoon (e)

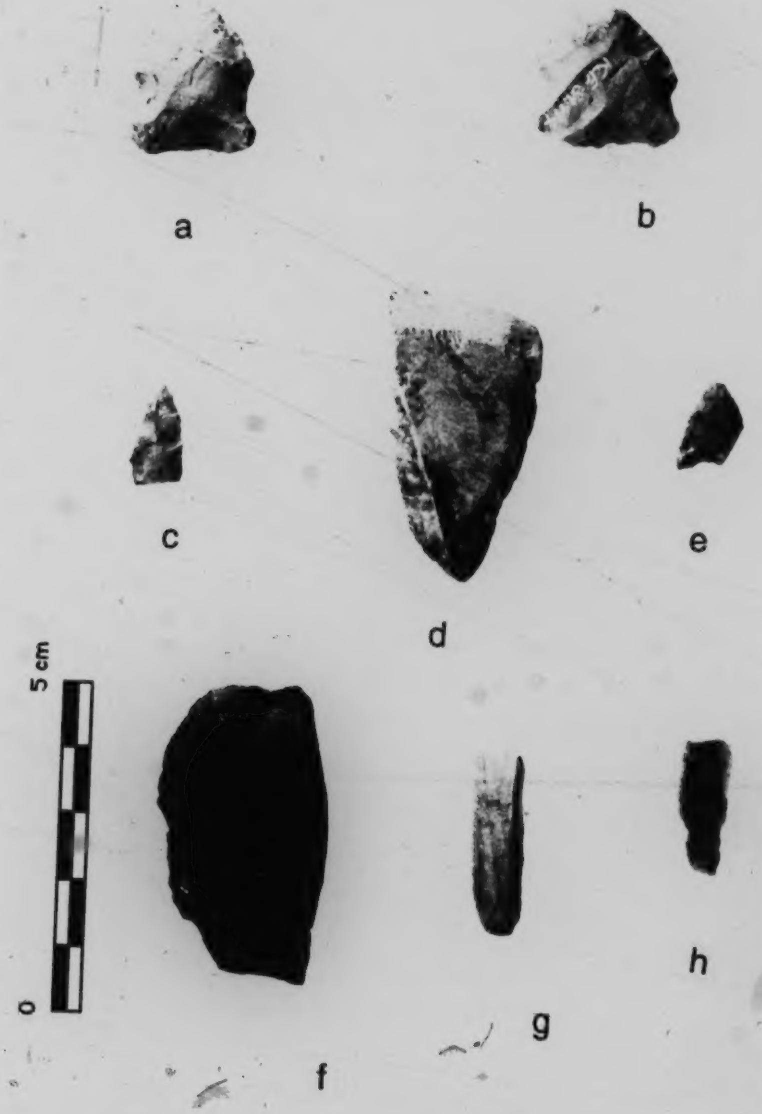

a
b
c
e
d
5cm
0
f
g
h

Plate 34. Tivi Paningayak site, area A (KcFr-8A): Adze (d), endblades (c, e), knives (a-b), microblade core (f) and microblades (g-h)

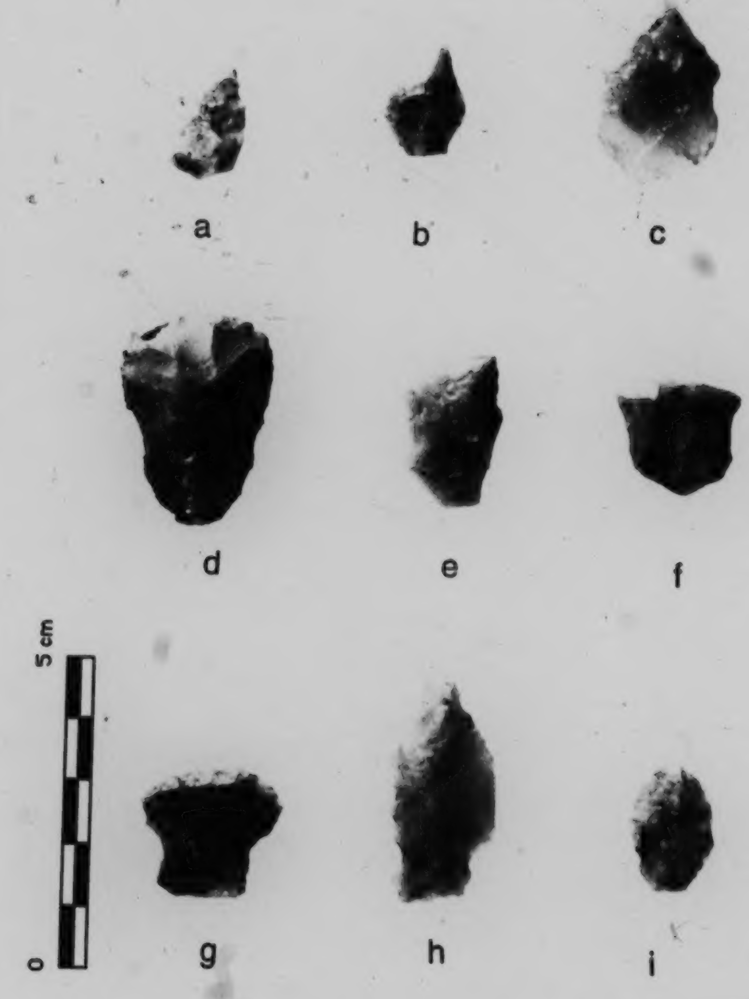

a
b
c
d
e
f
5 cm
0
g
h
i

Plate 35. Tivi Paningayak site, area A (KcFr-8A): Burin (a), drill (c), graver (b), endscrapers (e-g), sideblade (i) and sidescraper (h)

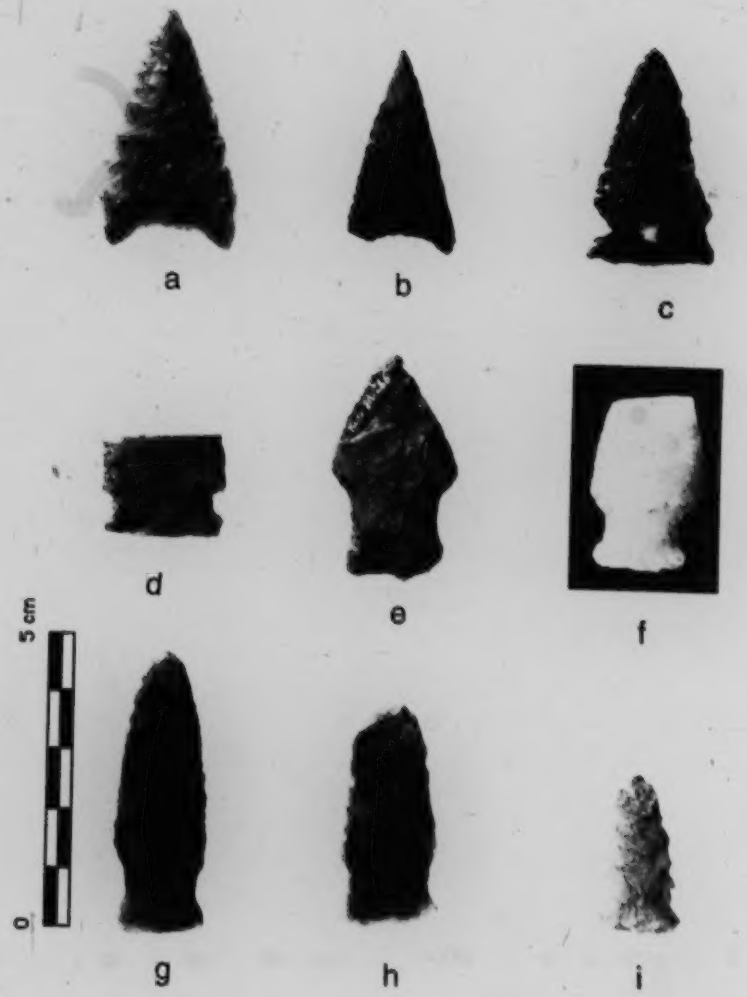
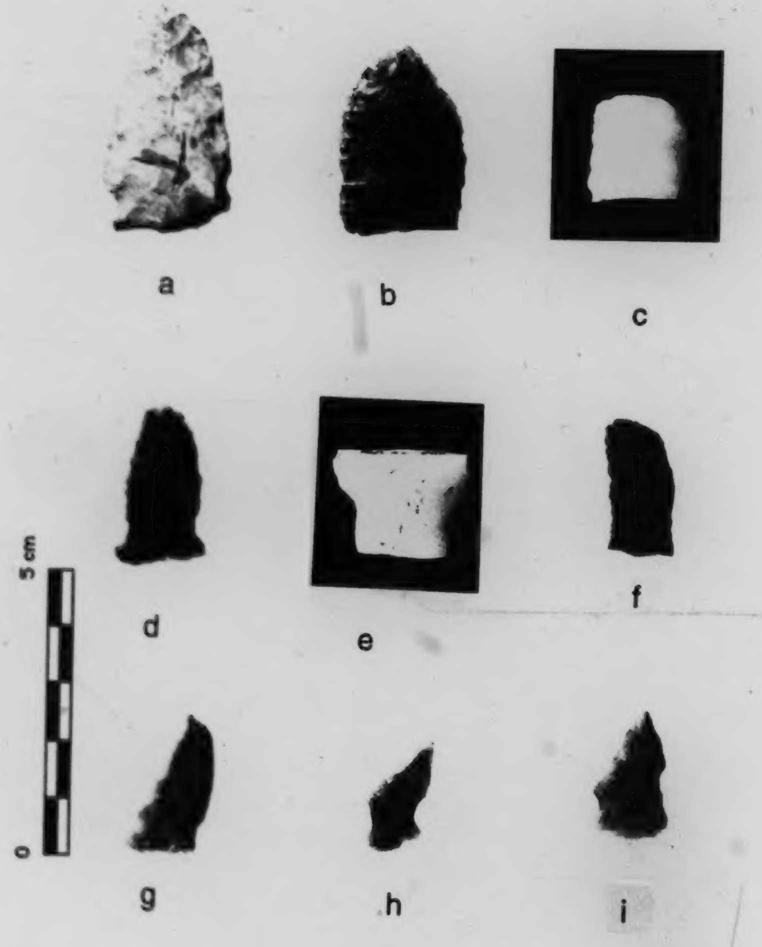

a
b
c
d
e
f
5 cm
0
g
h
i

Plate 36. Tivi Paningayak site, area A (KcFr-8A): Endblades (a-f, h-i) and knife (g)


a
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e
f
g
h
i
5 cm
0

Plate 37. Tivi Paningayak site, area A (KcFr-8A): Knives

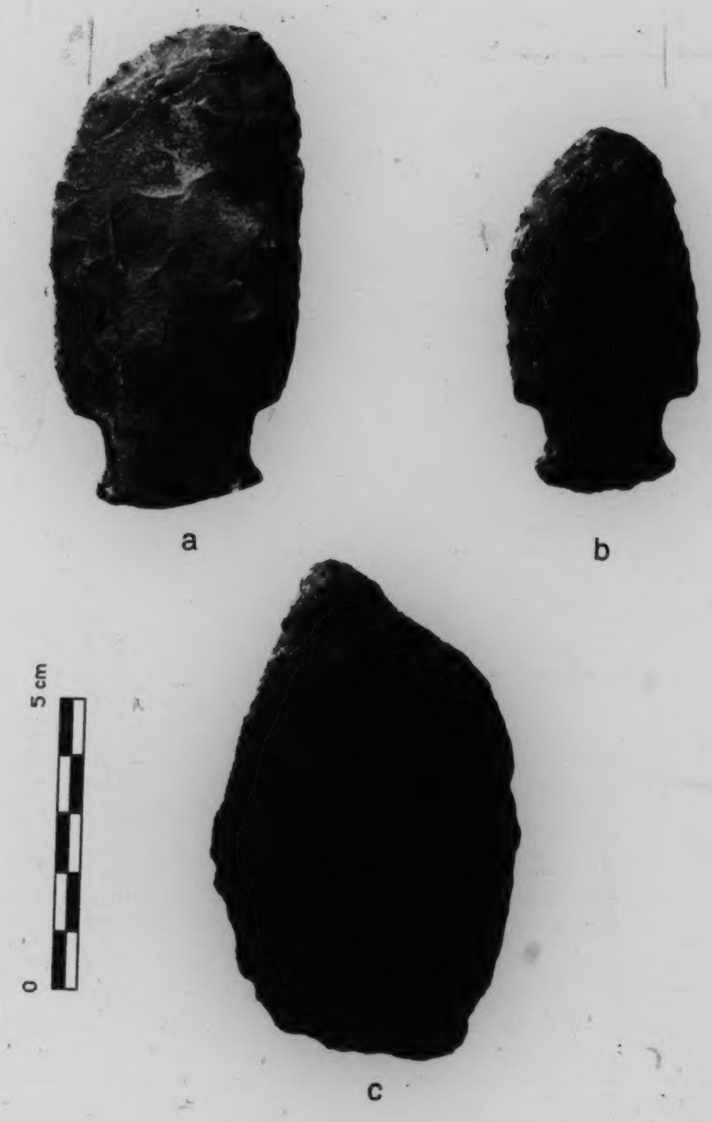


Plate 38. Tivi Paningayak site, area A (KcFr-8A): Large knives (a-b) and biface (c)

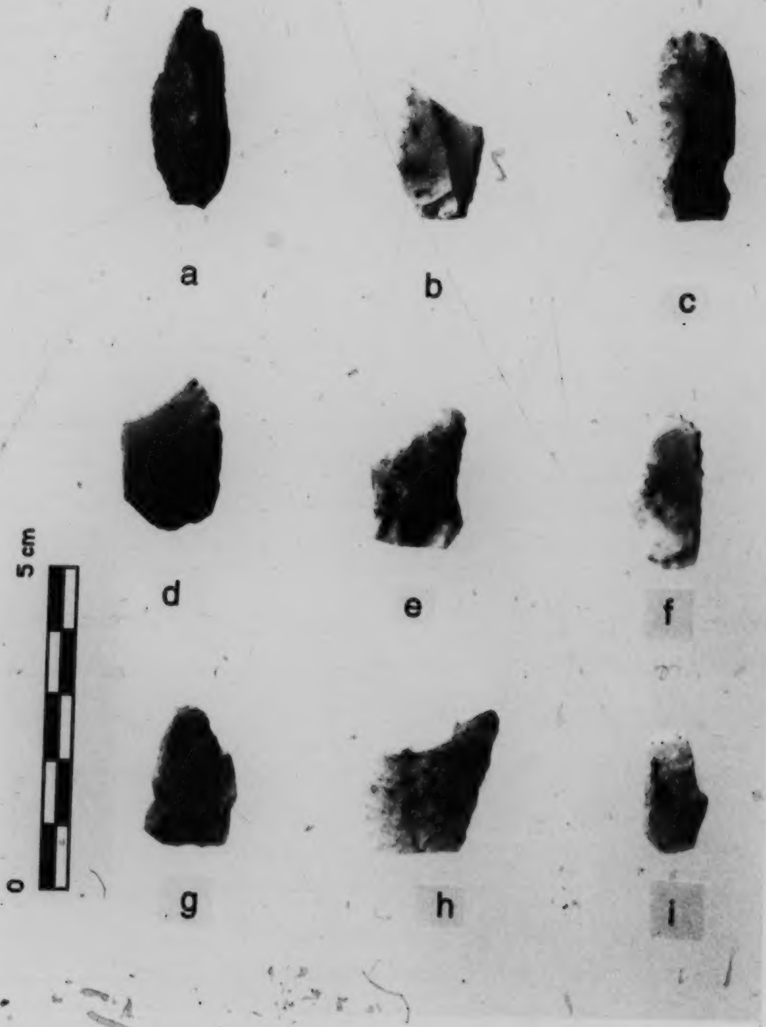
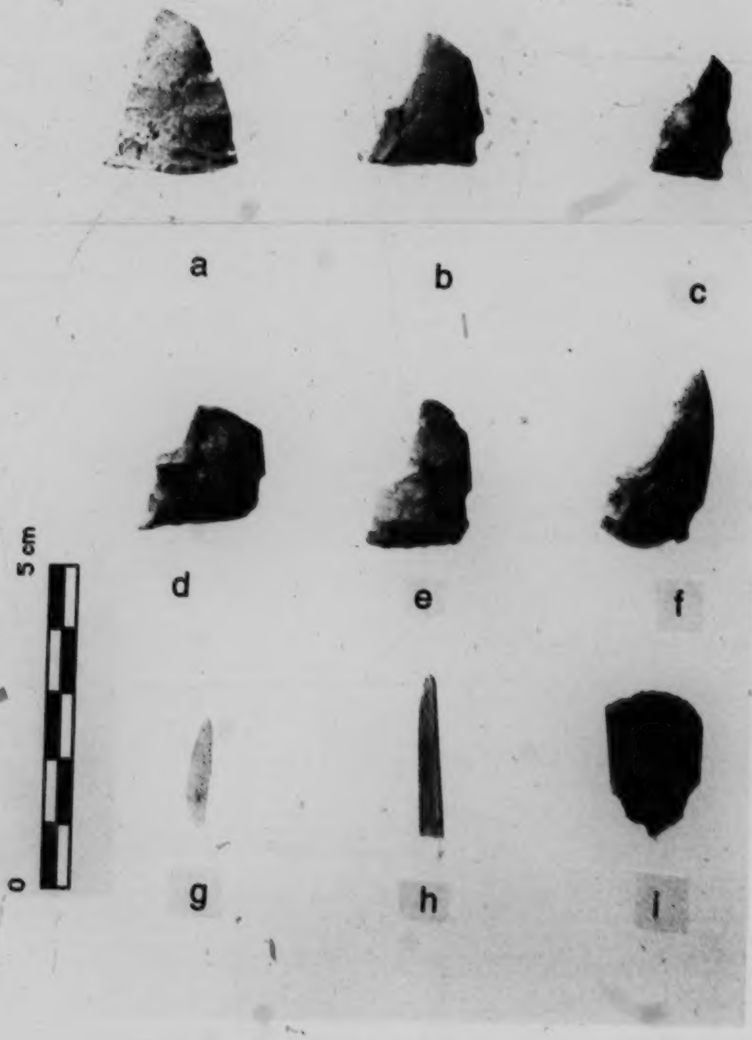

a
b
c
d
e
f
g
h
i
5 cm
0

Plate 39. Tivi Paningayak site, area A (KcFr-8A): Burins


a
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f
g
h
i
5 cm
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Plate 40. Tivi Paningayak site, area A (KcFr-8A): Burins (a-f), burin-like tool (i), and burin spalls (g-h)

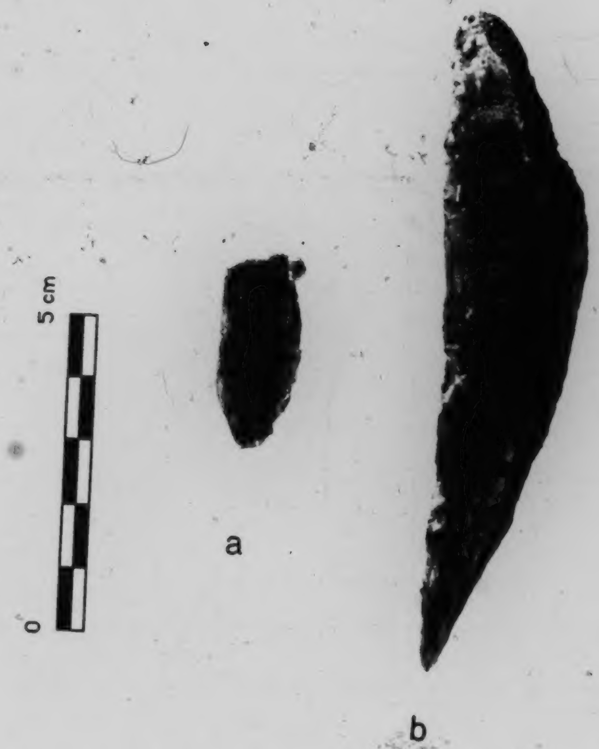


Plate 41. Tivi Paningayak site, area A (KcFr-8A): Miscellaneous organic artifacts; harpoon (a) and graved antler (b)

APPENDIX A

Tables of faunal remains from Ivujivik sites

Table 1 Pita site (KcFr-5): Caribou skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Antler	35	43.8	–	–	–	–
Cranium	0	0.0	0	0	0.00	0
Maxilla	0	0.0	0	0	0.00	0
Mandible	0	0.0	0	0	0.00	0
Teeth	0	0.0	0	0	0.00	0
Atlas	0	0.0	0	0	0.00	0
Axis	0	0.0	0	0	0.00	0
Cervical vertebrae 3-7	0	0.0	0	0	0.00	0
Thoracic vertebrae	0	0.0	0	0	0.00	0
Lumbar vertebrae	0	0.0	0	0	0.00	0
Sacrum/sacral vert.	0	0.0	0	0	0.00	0
Caudal vertebrae	1	1.3	1	33	0.09	6
Scapula	4	5.0	3	100	1.50	100
Sternum	0	0.0	0	0	0.00	0
Ribs	3	3.8	1	33	0.04	3
Humerus	4	5.0	3	100	1.50	100
Humerus (co.)	0	0.0	0	0	0.00	0
Humerus (prox.)	1	1.3	1	33	0.50	33
Humerus (shaft)	1	1.3	0	0	0.00	0
Humerus (dis.)	2	2.5	2	67	1.00	67
Radius	3	3.8	3	100	1.50	100
Radius (co.)	0	0.0	0	0	0.00	0
Radius (prox.)	2	2.5	2	67	1.00	67
Radius (shaft)	0	0.0	0	0	0.00	0
Radius (dis.)	1	1.3	1	33	0.50	33
Ulna	2	2.5	2	67	1.00	67
Ulna (co.)	0	0.0	0	0	0.00	0
Ulna (prox.)	2	2.5	2	67	1.00	67
Ulna (shaft)	0	0.0	0	0	0.00	0
Ulna (dis.)	0	0.0	0	0	0.00	0
Carpals	2	2.5	2	67	0.17	11
Metacarpal	2	2.5	2	67	0.18	12
Metacarpal (prox.)	2	2.5	2	67	0.18	12
Metacarpal (dis.)	0	0.0	0	0	0.00	0
Innominate	2	2.5	2	67	1.00	67
Femur	1	1.3	1	33	0.50	33
Femur (co.)	0	0.0	0	0	0.00	0
Femur (prox.)	1	1.3	1	33	0.50	33
Femur (shaft)	0	0.0	0	0	0.00	0
Femur (dis.)	0	0.0	0	0	0.00	0
Patella	0	0.0	0	0	0.00	0
Tibia	1	1.3	1	33	0.50	33
Tibia (co.)	0	0.0	0	0	0.00	0
Tibia (prox.)	0	0.0	0	0	0.00	0
Tibia (shaft)	1	1.3	1	33	0.50	33
Tibia (dis.)	0	0.0	0	0	0.00	0
Fibula	0	0.0	0	0	0.00	0
Tarsals	1	1.3	1	33	0.17	11
Metatarsal	3	3.8	2	67	1.00	67
Metatarsal (prox.)	1	1.3	1	33	0.50	33
Metatarsal (dis.)	1	1.3	1	33	0.50	33
Phalanges 1	1	1.3	1	33	0.13	8
Phalanges 2	1	1.3	1	33	0.13	8
Phalanges 3	3	3.8	2	67	0.25	17
Metapodial	4	5.0	–	–	–	–
Phalanges (unid.)	6	7.5	–	–	–	–
Vertebra (unid.)	1	1.3	–	–	–	–
TOTAL	80	100.0				

Table 2 Pita site (KcFr-5): Polar bear skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0
Maxilla	1	7.7	1	25	1.0	100
Mandible	1	7.7	1	25	0.5	50
Teeth	0	0.0	0	0	0.0	0
Atlas	0	0.0	0	0	0.0	0
Axis	0	0.0	0	0	0.0	0
Cervical vertebrae 3-7	0	0.0	0	0	0.0	0
Thoracic vertebrae	0	0.0	0	0	0.0	0
Lumbar vertebrae	0	0.0	0	0	0.0	0
Sacrum/sacral vert.	0	0.0	0	0	0.0	0
Caudal vertebrae	0	0.0	0	0	0.0	0
Scapula	0	0.0	0	0	0.0	0
Sternum	0	0.0	0	0	0.0	0
Ribs	0	0.0	0	0	0.0	0
Humerus	1	7.7	1	25	0.5	50
Humerus (co.)	0	0.0	0	0	0.0	0
Humerus (prox.)	1	7.7	1	25	0.5	50
Humerus (shaft)	0	0.0	0	0	0.0	0
Humerus (dis.)	0	0.0	0	0	0.0	0
Radius	0	0.0	0	0	0.0	0
Ulna	0	0.0	0	0	0.0	0
Carpals	1	7.7	1	25	0.1	7
Metacarpal	1	7.7	1	25	0.1	10
Innominate	0	0.0	0	0	0.0	0
Femur	0	0.0	0	0	0.0	0
Femur (co.)	1	7.7	1	25	0.5	50
Femur (prox.)	1	7.7	1	25	0.5	50
Femur (shaft)	0	0.0	0	0	0.0	0
Femur (dis.)	0	0.0	0	0	0.0	0
Patella	0	0.0	0	0	0.0	0
Tibia	1	7.7	1	25	0.5	50
Tibia (co.)	0	0.0	0	0	0.0	0
Tibia (prox.)	0	0.0	0	0	0.0	0
Tibia (shaft)	0	0.0	0	0	0.0	0
Tibia (dis.)	1	7.7	1	25	0.5	50
Fibula	0	0.0	0	0	0.0	0
Tarsals	4	30.8	4	100	0.5	50
Metatarsal	1	7.7	1	25	0.1	10
Phalanges 1	0	0.0	0	0	0.0	0
Phalanges 2	0	0.0	0	0	0.0	0
Phalanges 3	1	7.7	1	25	0.1	5
TOTAL	13	100.0				

Table 3 Pita site (KcFr-5): Bearded/large seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	9	10.5	2	13	1.0	33
Maxilla	1	1.2	1	7	0.5	17
Mandible	1	1.2	1	7	0.5	17
Teeth	1	1.2	1	7	1.0	33
Atlas	0	0.0	0	0	0.0	0
Axis	0	0.0	0	0	0.0	0
Cervical vertebrae 3-7	8	9.3	8	53	1.6	53
Thoracic vertebrae	3	3.5	3	20	0.2	7
Lumbar vertebrae	4	4.7	3	20	0.6	20
Sacrum/sacral vert.	0	0.0	0	0	0.0	0
Caudal vertebrae	1	1.2	1	7	0.1	3
Scapula	4	4.7	3	20	1.5	50
Sternum	1	1.2	1	11	0.1	4
Ribs	5	5.8	2	13	0.1	4
Humerus	2	2.3	2	13	1.0	33
Humerus (co.)	1	1.2	1	7	0.5	17
Humerus (prox.)	0	0.0	0	0	0.0	0
Humerus (shaft)	0	0.0	0	0	0.0	0
Humerus (dis.)	1	1.2	1	7	0.5	17
Radius	2	2.3	2	13	1.0	33
Radius (co.)	0	0.0	0	0	0.0	0
Radius (prox.)	2	2.3	2	13	1.0	33
Radius (shaft)	0	0.0	0	0	0.0	0
Radius (dis.)	0	0.0	0	0	0.0	0
Ulna	5	5.8	3	20	1.5	50
Ulna (co.)	1	1.2	1	7	0.5	17
Ulna (prox.)	1	1.2	1	7	0.5	17
Ulna (shaft)	1	1.2	1	7	0.5	17
Ulna (dis.)	2	2.3	2	13	1.0	33
Carpals	0	0.0	0	0	0.0	0
Metacarpals	1	1.2	1	7	0.1	3
F. Phalanges	1	1.2	1	7	0.0	1
Baculum	0	0.0	0	0	0.0	0
Innominate	8	9.3	6	40	3.0	100
Femur	1	1.2	1	7	0.5	17
Femur (co.)	0	0.0	0	0	0.0	0
Femur (prox.)	0	0.0	0	0	0.0	0
Femur (shaft)	0	0.0	0	0	0.0	0
Femur (dis.)	1	1.2	1	7	0.5	17
Patella	0	0.0	0	0	0.0	0
Tibia	2	2.3	2	13	1.0	33
Tibia (co.)	1	1.2	1	7	0.5	17
Tibia (prox.)	0	0.0	0	0	0.0	0
Tibia (shaft)	1	1.2	1	7	0.5	17
Tibia (dis.)	0	0.0	0	0	0.0	0
Fibula	3	3.5	3	20	1.5	50
Fibula (co.)	0	0.0	0	0	0.0	0
Fibula (prox.)	1	1.2	1	7	0.5	17
Fibula (shaft)	0	0.0	0	0	0.0	0
Fibula (dis.)	2	2.3	2	13	1.0	33
Astragalus	0	0.0	0	0	0.0	0
Calcaneum	1	1.2	1	7	0.5	17
Other tarsals	0	0.0	0	0	0.0	0
Metatarsals	5	5.8	5	33	0.5	17
H. Phalanges	3	3.5	3	20	0.1	4
Phalange (unid.)	1	1.2	-	-	-	-
Vertebrae (unid.)	13	15.1	-	-	-	-
TOTAL	86	100.0				

Table 4 Pita site (KcFr-5): Walrus skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	8	4.9	1	14	0.5	50
Maxilla	26	16.0	2	29	1.0	100
Mandible	0	0.0	0	0	0.0	0
Teeth	108	66.3	7	100	0.4	39
Atlas	0	0.0	0	0	0.0	0
Axis	0	0.0	0	0	0.0	0
Cervical vertebrae 3-7	0	0.0	0	0	0.0	0
Thoracic vertebrae	0	0.0	0	0	0.0	0
Lumbar vertebrae	0	0.0	0	0	0.0	0
Sacrum/sacral vert.	0	0.0	0	0	0.0	0
Caudal vertebrae	0	0.0	0	0	0.0	0
Scapula	0	0.0	0	0	0.0	0
Sternum	0	0.0	0	0	0.0	0
Ribs	11	6.7	2	29	0.1	13
Humerus	0	0.0	0	0	0.0	0
Humerus (co.)	0	0.0	0	0	0.0	0
Humerus (prox.)	0	0.0	0	0	0.0	0
Humerus (shaft)	0	0.0	0	0	0.0	0
Humerus (dis.)	0	0.0	0	0	0.0	0
Radius	1	0.6	1	14	0.5	50
Radius (co.)	0	0.0	0	0	0.0	0
Radius (prox.)	0	0.0	0	0	0.0	0
Radius (shaft)	0	0.0	0	0	0.0	0
Radius (dis.)	1	0.6	1	14	0.5	50
Ulna	1	0.6	1	14	0.5	50
Ulna (co.)	0	0.0	0	0	0.0	0
Ulna (prox.)	0	0.0	0	0	0.0	0
Ulna (shaft)	1	0.6	1	14	0.5	50
Ulna (dis.)	0	0.0	0	0	0.0	0
Carpals	1	0.6	1	14	0.1	8
Metacarpals	2	1.2	2	29	0.2	20
F. Phalanges	1	0.6	1	14	0.0	3
Baculum	0	0.0	0	0	0.0	0
Innominate	2	1.2	1	14	0.5	50
Femur	1	0.6	1	14	0.5	50
Femur (co.)	0	0.0	0	0	0.0	0
Femur (psh)	1	0.6	1	14	0.5	50
Femur (shaft)	0	0.0	0	0	0.0	0
Femur (dis.)	0	0.0	0	0	0.0	0
Patella	0	0.0	0	0	0.0	0
Tibia	0	0.0	0	0	0.0	0
Tibia (co.)	0	0.0	0	0	0.0	0
Tibia (prox.)	0	0.0	0	0	0.0	0
Tibia (shaft)	0	0.0	0	0	0.0	0
Tibia (dis.)	0	0.0	0	0	0.0	0
Fibula	0	0.0	0	0	0.0	0
Fibula (co.)	0	0.0	0	0	0.0	0
Fibula (prox.)	0	0.0	0	0	0.0	0
Fibula (shaft)	0	0.0	0	0	0.0	0
Fibula (dis.)	0	0.0	0	0	0.0	0
Astragalus	0	0.0	0	0	0.0	0
Calcaneum	0	0.0	0	0	0.0	0
Other tarsals	0	0.0	0	0	0.0	0
Metatarsals	0	0.0	0	0	0.0	0
H. Phalanges	0	0.0	0	0	0.0	0
Phalange (unid.)	1	0.6	–	–	–	–
TOTAL	163	100.0				

Table 5 Pita site (KcFr-5): Foetal/newborn small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0
Maxilla	0	0.0	0	0	0.0	0
Mandible	1	1.6	1	9	0.5	20
Teeth	0	0.0	0	0	0.0	0
Atlas	0	0.0	0	0	0.0	0
Axis	0	0.0	0	0	0.0	0
Cervical vertebrae 3-7	2	3.3	2	18	0.4	16
Thoracic vertebrae	0	0.0	0	0	0.0	0
Lumbar vertebrae	0	0.0	0	0	0.0	0
Sacral vert.	0	0.0	0	0	0.0	0
Caudal vertebrae	0	0.0	0	0	0.0	0
Scapula	3	4.9	3	27	1.5	60
Sternum	0	0.0	0	0	0.0	0
Ribs	2	3.3	2	18	0.1	5
Humerus	3	4.9	3	27	1.5	60
Humerus (co.)	0	0.0	0	0	0.0	0
Humerus (prox.)	0	0.0	0	0	0.0	0
Humerus (shaft)	2	3.3	2	18	1.0	40
Humerus (dis.)	1	1.6	1	9	0.5	20
Radius	6	9.8	5	45	2.5	100
Radius (co.)	3	4.9	3	27	1.5	60
Radius (prox.)	0	0.0	0	0	0.0	0
Radius (shaft)	2	3.3	2	18	1.0	40
Radius (dis.)	1	1.6	0	0	0.0	0
Ulna	4	6.6	4	36	2.0	80
Ulna (co.)	3	4.9	3	27	1.5	60
Ulna (prox.)	0	0.0	0	0	0.0	0
Ulna (shaft)	1	1.6	1	9	0.5	20
Ulna (dis.)	0	0.0	0	0	0.0	0
Carpals	0	0.0	0	0	0.0	0
Metacarpals	2	3.3	2	18	0.2	8
F. Phalanges	4	6.6	4	36	0.1	5
Baculum	0	0.0	0	0	0.0	0
Innominate	0	0.0	0	0	0.0	0
Femur	5	8.2	4	36	2.0	80
Femur (co.)	3	4.9	3	27	1.5	60
Femur (prox.)	1	1.6	1	9	0.5	20
Femur (shaft)	1	1.6	1	9	0.5	20
Femur (dis.)	0	0.0	0	0	0.0	0
Patella	0	0.0	0	0	0.0	0
Tibia	3	4.9	3	27	1.5	60
Tibia (co.)	0	0.0	0	0	0.0	0
Tibia (prox.)	1	1.6	1	9	0.5	20
Tibia (shaft)	2	3.3	2	18	1.0	40
Tibia (dis.)	0	0.0	0	0	0.0	0
Fibula	3	4.9	2	18	1.0	40
Fibula (co.)	0	0.0	0	0	0.0	0
Fibula (prox.)	0	0.0	0	0	0.0	0
Fibula (shaft)	0	0.0	0	0	0.0	0
Fibula (dis.)	3	4.9	2	18	1.0	40
Astragalus	0	0.0	0	0	0.0	0
Calcaneum	1	1.6	1	9	0.5	20
Other tarsals	1	1.6	1	9	0.1	3
Metatarsals	11	18.0	11	100	1.1	44
H. Phalanges	9	14.8	9	82	0.3	13
Phalange (unid.)	1	1.6	-	-	-	-
TOTAL	61	100.0				

Table 6 Pita site (KcFr-5): Juvenile small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.00	0.00
Maxilla	4	0.2	2	1	1.00	1.45
Mandible	29	1.6	28	19	14.00	20.29
Teeth	36	2.0	36	25	2.00	2.90
Atlas	2	0.1	2	1	2.00	2.90
Axis	13	0.7	13	9	13.00	18.84
Cervical vertebrae 3-7	52	2.8	50	35	10.00	14.49
Thoracic vertebrae	14	0.8	14	10	0.93	1.35
Lumbar vertebrae	26	1.4	20	14	4.00	5.80
Sacral vertebra 1	23	1.3	16	11	16.00	23.19
Other sacral vertebrae	16	0.9	14	10	4.67	6.76
Caudal vertebrae	31	1.7	28	19	2.33	3.38
Scapula	37	2.0	33	23	16.50	23.91
Sternum	8	0.4	8	6	0.89	1.29
Ribs	57	3.1	27	19	1.80	2.61
Humerus	246	13.4	138	96	69.00	100.00
Humerus (co.)	53	2.9	53	37	26.50	38.41
Humerus (prox.)	5	0.3	5	3	2.50	3.62
Humerus (prox. + shaft)	4	0.2	4	3	2.00	2.90
Humerus (shaft)	67	3.7	67	47	33.50	48.55
Humerus (dis.)	19	1.0	19	13	9.50	13.77
Humerus (dis. + shaft)	18	1.0	18	13	9.00	13.04
Humerus (epiphysis, prox.)	31	1.7	31	22	15.50	22.46
Humerus (epiphysis, dis.)	49	2.7	49	34	24.50	35.51
Radius	98	5.3	45	31	22.50	32.61
Radius (co.)	21	1.1	21	15	10.50	15.22
Radius (prox.)	14	0.8	14	10	7.00	10.14
Radius (prox. + shaft)	4	0.2	4	3	2.00	2.90
Radius (shaft)	15	0.8	15	10	7.50	10.87
Radius (dis.)	8	0.4	8	6	4.00	5.80
Radius (dis. + shaft)	5	0.3	5	3	2.50	3.62
Radius (epiphysis, prox.)	15	0.8	15	10	7.50	10.87
Radius (epiphysis, dis.)	16	0.9	16	11	8.00	11.59
Ulna	58	3.2	42	29	21.00	30.43
Ulna (co.)	12	0.7	12	8	6.00	8.70
Ulna (prox.)	5	0.3	5	3	2.50	3.62
Ulna (prox. + shaft)	9	0.5	9	6	4.50	6.52
Ulna (shaft)	18	1.0	18	13	9.00	13.04
Ulna (dis.)	2	0.1	2	1	1.00	1.45
Ulna (dis. + shaft)	3	0.2	3	2	1.50	2.17
Ulna (epiphysis, prox.)	1	0.1	1	1	0.50	0.72
Ulna (epiphysis, dis.)	8	0.4	8	6	4.00	5.80
Carpals	9	0.5	9	6	0.75	1.09
Metacarpals	86	4.7	81	56	8.10	11.74
F. Phalanges	75	4.1	73	51	2.43	3.53
Baculum	1	0.1	1	1	0.03	0.05
Innominate	58	3.2	34	24	17.00	24.64
Femur	142	7.8	87	60	43.50	63.04
Femur (co.)	35	1.9	25	17	12.50	18.12
Femur (prox.)	7	0.4	7	5	3.50	5.07
Femur (prox. + shaft)	6	0.3	6	4	3.00	4.35
Femur (shaft)	43	2.3	43	30	21.50	31.16
Femur (dis.)	1	0.1	1	1	0.50	0.72
Femur (dis. + shaft)	4	0.2	3	2	1.50	2.17
Femur (epiphysis, prox.)	14	0.8	14	10	7.00	10.14
Femur (epiphysis, dis.)	32	1.7	32	22	16.00	23.19
Patella	9	0.5	9	6	4.50	6.52

Table 6 (cont.) Pita site (KcFr-5): Juvenile small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Tibia	130	7.1	70	49	35.00	50.72
Tibia (co.)	7	0.4	7	5	3.50	5.07
Tibia (prox.)	20	1.1	20	14	10.00	14.49
Tibia (shaft)	50	2.7	50	35	25.00	36.23
Tibia (dis.)	4	0.2	4	3	2.00	2.90
Tibia (dis. + shaft)	13	0.7	13	9	6.50	9.42
Tibia (epiphysis, prox.)	20	1.1	20	14	10.00	14.49
Tibia (epiphysis, dis.)	16	0.9	16	11	8.00	11.59
Fibula	49	2.7	22	15	11.00	15.94
Fibula (co.)	3	0.2	3	2	1.50	2.17
Fibula (prox.)	6	0.3	6	4	3.00	4.35
Fibula (shaft)	5	0.3	5	3	2.50	3.62
Fibula (dis.)	8	0.4	8	6	4.00	5.80
Fibula (dis. + shaft)	14	0.8	14	10	7.00	10.14
Fibula (epiphysis, prox.)	0	0.0	0	0	0.00	0.00
Fibula (epiphysis, dis.)	13	0.7	13	9	6.50	9.42
Astragalus	10	0.5	8	6	4.00	5.80
Calcaneum	32	1.7	27	19	13.50	19.57
Other tarsals	27	1.5	20	14	1.67	2.42
Metatarsals	162	8.8	144	100	14.40	20.87
H. Phalanges	130	7.1	121	84	4.32	6.26
Metapodial	3	0.2	–	–	–	–
Phalanges (unid.)	20	1.1	–	–	–	–
Vertebrae (unid.)	139	7.6	–	–	–	–
TOTAL	1832	100.0				

Table 7 Pita site (KcFr-5): Subadult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0
Maxilla	1	0.0	1	1	0.5	1
Mandible	10	0.4	10	6	5.0	13
Teeth	7	0.3	7	4	0.4	1
Atlas	2	0.1	2	1	2.0	5
Axis	15	0.6	15	9	15.0	39
Cervical vertebrae 3-7	101	4.1	99	63	19.8	51
Thoracic vertebrae	96	3.9	95	60	6.3	16
Lumbar vertebrae	117	4.7	117	74	23.4	61
Sacral vertebra 1	17	0.7	17	11	17.0	44
Other sacral vertebrae	39	1.6	39	25	13.0	34
Caudal vertebrae	75	3.0	72	46	6.0	16
Scapula	0	0.0	0	0	0.0	0
Sternum	27	1.1	7	4	0.8	2
Ribs	186	7.5	158	100	10.5	27
Humerus	209	8.5	72	46	36.0	94
Humerus (co.)	35	1.4	35	22	17.5	45
Humerus (prox.)	14	0.6	14	9	7.0	18
Humerus (prox. + shaft)	2	0.1	2	1	1.0	3
Humerus (shaft)	21	0.8	21	13	10.5	27
Humerus (dis.)	11	0.4	11	7	5.5	14
Humerus (dis. + shaft)	5	0.2	5	3	2.5	6
Humerus (epiphysis, prox.)	72	2.9	72	46	36.0	94
Humerus (epiphysis, dis.)	49	2.0	49	31	24.5	64
Radius	150	6.1	51	32	25.5	66
Radius (co.)	25	1.0	25	16	12.5	32
Radius (prox.)	19	0.8	19	12	9.5	25
Radius (prox. + shaft)	9	0.4	9	6	4.5	12
Radius (shaft)	7	0.3	7	4	3.5	9
Radius (dis.)	14	0.6	14	9	7.0	18
Radius (dis. + shaft)	10	0.4	10	6	5.0	13
Radius (epiphysis, prox.)	29	1.2	29	18	14.5	38
Radius (epiphysis, dis.)	37	1.5	37	23	18.5	48
Ulna	105	4.2	34	22	17.0	44
Ulna (co.)	14	0.6	14	9	7.0	18
Ulna (prox.)	30	1.2	30	19	15.0	39
Ulna (prox. + shaft)	11	0.4	11	7	5.5	14
Ulna (shaft)	5	0.2	5	3	2.5	6
Ulna (dis.)	23	0.9	23	15	11.5	30
Ulna (dis. + shaft)	4	0.2	4	3	2.0	5
Ulna (epiphysis, prox.)	12	0.5	12	8	6.0	16
Ulna (epiphysis, dis.)	6	0.2	6	4	3.0	8
Carpals	0	0.0	0	0	0.0	0
Metacarpals	29	1.2	28	18	2.8	7
F. Phalanges	66	2.7	65	41	2.2	6
Baculum	0	0.0	0	0	0.0	0
Innominate	0	0.0	0	0	0.0	0
Femur	194	7.9	77	49	38.5	100
Femur (co.)	34	1.4	34	22	17.0	44
Femur (prox.)	14	0.6	14	9	7.0	18
Femur (prox. + shaft)	11	0.4	11	7	5.5	14
Femur (shaft)	11	0.4	11	7	5.5	14
Femur (dis.)	14	0.6	14	9	7.0	18
Femur (dis. + shaft)	2	0.1	2	1	1.0	3
Femur (epiphysis, prox.)	31	1.3	31	20	15.5	40
Femur (epiphysis, dis.)	77	3.1	77	49	38.5	100
Patella	4	0.2	4	3	2.0	5

Table 7 (cont.) Pita site (KcFr-5): Subadult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Tibia	142	5.7	51	32	25.5	66
Tibia (co.)	6	0.2	6	4	3.0	8
Tibia (prox.)	20	0.8	20	13	10.0	26
Tibia (prox. + shaft)	5	0.2	5	3	2.5	6
Tibia (shaft)	6	0.2	6	4	3.0	8
Tibia (dis.)	13	0.5	13	8	6.5	17
Tibia (dis. + shaft)	14	0.6	14	9	7.0	18
Tibia (epiphysis, prox.)	51	2.1	51	32	25.5	66
Tibia (epiphysis, dis.)	27	1.1	27	17	13.5	35
Fibula	51	2.1	24	15	12.0	31
Fibula (co.)	1	0.0	1	1	0.5	1
Fibula (prox.)	13	0.5	13	8	6.5	17
Fibula (shaft)	0	0.0	0	0	0.0	0
Fibula (dis.)	11	0.4	11	7	5.5	14
Fibula (dis. + shaft)	12	0.5	12	8	6.0	16
Fibula (epiphysis, prox.)	1	0.0	1	1	0.5	1
Fibula (epiphysis, dis.)	13	0.5	13	8	6.5	17
Astragalus	7	0.3	7	4	3.5	9
Calcaneum	18	0.7	18	11	9.0	23
Other tarsals	0	0.0	0	0	0.0	0
Metatarsals	78	3.2	60	38	6.0	16
H. Phalanges	125	5.1	113	72	4.0	10
Phalanges (unid.)	22	0.9	–	–	–	–
Vertebrae (unid.)	578	23.4	–	–	–	–
TOTAL	2471	100.0				

Table 8 Pita site (KcFr-5): Adult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0
Maxilla	0	0.0	0	0	0.0	0
Mandible	5	0.4	5	4	2.5	5
Teeth	9	0.7	9	7	0.5	1
Atlas	0	0.0	0	0	0.0	0
Axis	13	1.0	13	10	13.0	28
Cervical vertebrae 3-7	26	2.0	24	18	4.8	10
Thoracic vertebrae	36	2.7	36	28	2.4	5
Lumbar vertebrae	46	3.5	46	35	9.2	20
Sacrum (fused)	21	1.6	19	15	19.0	41
Caudal vertebrae	44	3.4	43	33	3.6	8
Scapula	0	0.0	0	0	0.0	0
Sternum	0	0.0	0	0	0.0	0
Ribs	118	9.0	103	79	6.9	15
Humerus	133	10.1	93	72	46.5	100
Humerus (co.)	39	3.0	39	30	19.5	42
Humerus (prox.)	27	2.1	27	21	13.5	29
Humerus (prox. + shaft)	7	0.5	7	5	3.5	8
Humerus (shaft)	6	0.5	6	5	3.0	6
Humerus (dis.)	30	2.3	30	23	15.0	32
Humerus (dis. + shaft)	24	1.8	24	18	12.0	26
Radius	65	5.0	53	41	26.5	57
Radius (co.)	7	0.5	7	5	3.5	8
Radius (prox.)	35	2.7	35	27	17.5	38
Radius (prox. + shaft)	11	0.8	11	8	5.5	12
Radius (shaft)	2	0.2	2	2	1.0	2
Radius (dis.)	6	0.5	6	5	3.0	6
Radius (dis. + shaft)	4	0.3	4	3	2.0	4
Ulna	40	3.1	31	24	15.5	33
Ulna (co.)	4	0.3	4	3	2.0	4
Ulna (prox.)	19	1.4	19	15	9.5	20
Ulna (prox. + shaft)	8	0.6	8	6	4.0	9
Ulna (shaft)	1	0.1	1	1	0.5	1
Ulna (dis.)	6	0.5	6	5	3.0	6
Ulna (dis. + shaft)	2	0.2	2	2	1.0	2
Carpals	0	0.0	0	0	0.0	0
Metacarpals	80	6.1	79	61	7.9	17
F. Phalanges	125	9.5	122	94	4.1	9
Baculum	0	0.0	0	0	0.0	0
Innominate	0	0.0	0	0	0.0	0
Femur	90	6.9	50	38	25.0	54
Femur (co.)	11	0.8	11	8	5.5	12
Femur (prox.)	28	2.1	28	22	14.0	30
Femur (prox. + shaft)	11	0.8	11	8	5.5	12
Femur (shaft)	2	0.2	2	2	1.0	2
Femur (dis.)	31	2.4	31	24	15.5	33
Femur (dis. + shaft)	7	0.5	7	5	3.5	8
Patella	2	0.2	2	2	1.0	2
Tibia	57	4.3	35	27	17.5	38
Tibia (co.)	1	0.1	1	1	0.5	1
Tibia (prox.)	37	2.8	37	28	18.5	40
Tibia (prox. + shaft)	0	0.0	0	0	0.0	0
Tibia (shaft)	1	0.1	1	1	0.5	1
Tibia (dis.)	8	0.6	8	6	4.0	9
Tibia (dis. + shaft)	10	0.8	10	8	5.0	11

Table 8 (cont.) Pita site (KcFr-5): Adult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Fibula	16	1.2	9	7	4.5	10
Fibula (co.)	0	0.0	0	0	0.0	0
Fibula (prox.)	4	0.3	4	3	2.0	4
Fibula (shaft)	3	0.2	3	2	1.5	3
Fibula (dis.)	6	0.5	6	5	3.0	6
Fibula (dis. + shaft)	3	0.2	3	2	1.5	3
Astragalus	10	0.8	10	8	5.0	11
Calcaneum	13	1.0	13	10	6.5	14
Other tarsals	0	0.0	0	0	0.0	0
Metatarsals	82	6.3	82	63	8.2	18
H. Phalanges	134	10.2	130	100	4.6	10
Metapodial	1	0.1	–	–	–	–
Phalanges (unid.)	16	1.2	–	–	–	–
Vertebrae (unid.)	129	9.8	–	–	–	–
TOTAL	1311	100.0				

Table 9 Pita site (KcFr-5): Subadult or adult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	1051	15.0	129	69.7	64.5	100.0
Maxilla	67	1.0	33	17.8	16.5	25.6
Mandible	128	1.8	95	51.4	47.5	73.6
Teeth	189	2.7	185	100.0	10.3	15.9
Atlas	44	0.6	15	8.1	15.0	23.3
Axis	13	0.2	8	4.3	8.0	12.4
Cervical vertebrae 3-7	32	0.5	2	1.1	0.4	0.6
Thoracic vertebrae	7	0.1	1	0.5	0.1	0.1
Lumbar vertebrae	15	0.2	2	1.1	0.4	0.6
Sacrum (fused)	8	0.1	5	2.7	5.0	7.8
Caudal vertebrae	7	0.1	6	3.2	0.5	0.8
Scapula	311	4.5	125	67.6	62.5	96.9
Sternum	21	0.3	21	11.4	2.3	3.6
Ribs	2725	39.0	84	45.4	5.6	8.7
Humerus	80	1.1	60	32.4	30.0	46.5
Humerus (co.)	0	0.0	0	0.0	0.0	0.0
Humerus (prox.)	10	0.1	10	5.4	5.0	7.8
Humerus (prox. + shaft)	2	0.0	2	1.1	1.0	1.6
Humerus (shaft)	53	0.8	53	28.6	26.5	41.1
Humerus (dis.)	10	0.1	10	5.4	5.0	7.8
Humerus (dis. + shaft)	5	0.1	5	2.7	2.5	3.9
Radius	42	0.6	21	11.4	10.5	16.3
Radius (co.)	0	0.0	0	0.0	0.0	0.0
Radius (prox.)	16	0.2	16	8.6	8.0	12.4
Radius (prox. + shaft)	1	0.0	1	0.5	0.5	0.8
Radius (shaft)	20	0.3	20	10.8	10.0	15.5
Radius (dis.)	5	0.1	5	2.7	2.5	3.9
Radius (dis. + shaft)	0	0.0	0	0.0	0.0	0.0
Ulna	89	1.3	66	35.7	33.0	51.2
Ulna (co.)	0	0.0	0	0.0	0.0	0.0
Ulna (prox.)	20	0.3	20	10.8	10.0	15.5
Ulna (prox. + shaft)	2	0.0	2	1.1	1.0	1.6
Ulna (shaft)	64	0.9	64	34.6	32.0	49.6
Ulna (dis.)	3	0.0	3	1.6	1.5	2.3
Carpals	21	0.3	19	10.3	1.6	2.5
Metacarpals	30	0.4	27	14.6	2.7	4.2
F. Phalanges	34	0.5	28	15.1	0.9	1.4
Baculum	6	0.1	5	2.7	5.0	7.8
Innominate	333	4.8	114	61.6	57.0	88.4
Femur	64	0.9	49	26.5	24.5	38.0
Femur (co.)	0	0.0	0	0.0	0.0	0.0
Femur (prox.)	11	0.2	11	5.9	5.5	8.5
Femur (prox. + shaft)	3	0.0	3	1.6	1.5	2.3
Femur (shaft)	46	0.7	46	24.9	23.0	35.7
Femur (dis.)	4	0.1	4	2.2	2.0	3.1
Patella	14	0.2	14	7.6	7.0	10.9
Tibia	92	1.3	67	36.2	33.5	51.9
Tibia (co.)	0	0.0	0	0.0	0.0	0.0
Tibia (prox.)	11	0.2	11	5.9	5.5	8.5
Tibia (shaft)	72	1.0	71	38.4	35.5	55.0
Tibia (dis.)	8	0.1	8	4.3	4.0	6.2
Tibia (dis. + shaft)	1	0.0	1	0.5	0.5	0.8

Table 9 (cont.) Pita site (KcFr-5): Subadult or adult small seal skeletal

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Fibula	27	0.4	21	11.4	10.5	16.3
Fibula (co.)	0	0.0	0	0.0	0.0	0.0
Fibula (prox.)	1	0.0	1	0.5	0.5	0.8
Fibula (prox. + shaft)	1	0.0	1	0.5	0.5	0.8
Fibula (shaft)	19	0.3	19	10.3	9.5	14.7
Fibula (dis.)	5	0.1	5	2.7	2.5	3.9
Fibula (dis. + shaft)	1	0.0	1	0.5	0.5	0.8
Astragalus	91	1.3	68	36.8	34.0	52.7
Calcaneum	25	0.4	18	9.7	9.0	14.0
Other tarsals	67	1.0	58	31.4	4.8	7.5
Metatarsals	119	1.7	103	55.7	10.3	16.0
H. Phalanges	109	1.6	93	50.3	3.3	5.1
Claw	4	0.1	–	–	–	–
Metapodial	1	0.0	–	–	–	–
Phalanges (unid.)	45	0.6	–	–	–	–
Vertebrae (unid.)	1073	15.4	–	–	–	–
TOTAL	6984	100.0				

Table 10 Pita site (KcFr-5): Small seal skeletal parts (all ages)

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	1052	8.3	130	27.8	65.0	35.5
Maxilla	72	0.6	36	7.7	18.0	9.8
Mandible	172	1.4	138	29.5	69.0	37.7
Teeth	241	1.9	237	50.6	13.2	7.2
Atlas	48	0.4	19	4.1	19.0	10.4
Axis	54	0.4	49	10.5	49.0	26.8
Cervical vertebrae 3-7	213	1.7	179	38.2	35.8	19.6
Thoracic vertebrae	153	1.2	146	31.2	9.7	5.3
Lumbar vertebrae	204	1.6	185	39.5	37.0	20.2
Sacral vertebra 1	40	0.3	33	7.1	33.0	18.0
Other sacral vertebrae	55	0.4	53	11.3	17.7	9.7
Sacrum (fused)	29	0.2	24	5.1	24.0	13.1
Caudal vertebrae	157	1.2	149	31.8	12.4	6.8
Scapula	351	2.8	161	34.4	80.5	44.0
Sternum	56	0.4	36	7.7	4.0	2.2
Ribs	3088	24.4	374	79.9	24.9	13.6
Humerus	671	5.3	366	78.2	183.0	100.0
Humerus (co.)	127	1.0	127	27.1	63.5	34.7
Humerus (prox.)	56	0.4	56	12.0	28.0	15.3
Humerus (prox. + shaft)	15	0.1	15	3.2	7.5	4.1
Humerus (shaft)	149	1.2	149	31.8	74.5	40.7
Humerus (dis.)	71	0.6	71	15.2	35.5	19.4
Humerus (dis. + shaft)	52	0.4	52	11.1	26.0	14.2
Humerus (epiphysis, prox.)	103	0.8	103	22.0	51.5	28.1
Humerus (epiphysis, dis.)	98	0.8	98	20.9	49.0	26.8
Radius	361	2.9	161	34.4	80.5	44.0
Radius (co.)	56	0.4	50	10.7	25.0	13.7
Radius (prox.)	84	0.7	80	17.1	40.0	21.9
Radius (prox. + shaft)	25	0.2	25	5.3	12.5	6.8
Radius (shaft)	46	0.4	46	9.8	23.0	12.6
Radius (dis.)	34	0.3	34	7.3	17.0	9.3
Radius (dis. + shaft)	19	0.2	19	4.1	9.5	5.2
Radius (epiphysis, prox.)	44	0.3	44	9.4	22.0	12.0
Radius (epiphysis, dis.)	53	0.4	53	11.3	26.5	14.5
Ulna	296	2.3	177	37.8	88.5	48.4
Ulna (co.)	33	0.3	33	7.1	16.5	9.0
Ulna (prox.)	74	0.6	74	15.8	37.0	20.2
Ulna (prox. + shaft)	30	0.2	30	6.4	15.0	8.2
Ulna (shaft)	89	0.7	89	19.0	44.5	24.3
Ulna (dis.)	34	0.3	34	7.3	17.0	9.3
Ulna (dis. + shaft)	9	0.1	9	1.9	4.5	2.5
Ulna (epiphysis, prox.)	13	0.1	13	2.8	6.5	3.6
Ulna (epiphysis, dis.)	14	0.1	14	3.0	7.0	3.8
Carpals	30	0.2	28	6.0	2.3	1.3
Metacarpals	227	1.8	217	46.4	21.7	11.9
F. Phalanges	304	2.4	292	62.4	9.7	5.3
Baculum	7	0.1	6	1.3	6.0	3.3
Innominate	391	3.1	148	31.6	74.0	40.4
Femur	495	3.9	267	57.1	133.5	73.0
Femur (co.)	83	0.7	73	15.6	36.5	19.9
Femur (prox.)	61	0.5	61	13.0	30.5	16.7
Femur (prox. + shaft)	31	0.2	31	6.6	15.5	8.5
Femur (shaft)	103	0.8	103	22.0	51.5	28.1
Femur (dis.)	50	0.4	50	10.7	25.0	13.7
Femur (dis. + shaft)	13	0.1	13	2.8	6.5	3.6
Femur (epiphysis, prox.)	45	0.4	45	9.6	22.5	12.3
Femur (epiphysis, dis.)	109	0.9	109	23.3	54.5	29.8
Patella	29	0.2	29	6.2	14.5	7.9

Table 10 (cont.) Pita site (KcFr-5): Small seal skeletal parts (all ages)

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Tibia	424	3.3	248	53.0	124.0	67.8
Tibia (co.)	14	0.1	14	3.0	7.0	3.8
Tibia (prox.)	89	0.7	89	19.0	44.5	24.3
Tibia (prox. + shaft)	5	0.0	5	1.1	2.5	1.4
Tibia (shaft)	131	1.0	130	27.8	65.0	35.5
Tibia (dis.)	33	0.3	33	7.1	16.5	9.0
Tibia (dis. + shaft)	38	0.3	38	8.1	19.0	10.4
Tibia (epiphysis, prox.)	71	0.6	71	15.2	35.5	19.4
Tibia (epiphysis, dis.)	43	0.3	43	9.2	21.5	11.7
Fibula	146	1.2	84	17.9	42.0	23.0
Fibula (co.)	4	0.0	4	0.9	2.0	1.1
Fibula (prox.)	24	0.2	24	5.1	12.0	6.6
Fibula (prox. + shaft)	1	0.0	1	0.2	0.5	0.3
Fibula (shaft)	27	0.2	27	5.8	13.5	7.4
Fibula (dis.)	33	0.3	32	6.8	16.0	8.7
Fibula (dis. + shaft)	30	0.2	30	6.4	15.0	8.2
Fibula (epiphysis, prox.)	1	0.0	1	0.2	0.5	0.3
Fibula (epiphysis, dis.)	26	0.2	26	5.6	13.0	7.1
Astragalus	118	0.9	93	19.9	46.5	25.4
Calcaneum	89	0.7	77	16.5	38.5	21.0
Other tarsals	95	0.8	79	16.9	6.6	3.6
Metatarsals	452	3.6	400	85.5	40.0	21.9
H. Phalanges	507	4.0	468	100.0	16.7	9.1
Claw	4	0.0	-	-	-	-
Metapodial	5	0.0	-	-	-	-
Phalanges (unid.)	104	0.8	-	-	-	-
Vertebrae (unid.)	1919	15.2	-	-	-	-
TOTAL	12659	100.0				

Table 11 Pita site (KcFr-5): Altered faunal remains

Bone alterations	N	% of altered bones	% of all bones (N=15,572)
splintered and/or undiagnostic gnawing marks	10536	78.09	67.66
spiral fracture	2685	19.90	17.24
worked	104	0.77	0.67
carnivore chewed	67	0.50	0.43
cut marks	51	0.38	0.33
burnt	49	0.36	0.31
TOTAL	13492	100.00	86.64

Table 12 Ohituk site (KcFr-3A): Caribou skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Antler	11	19.6	-	-	-	-
Cranium	0	0.0	0	0	0.00	0
Maxilla	1	1.8	1	9	0.00	0
Mandible	3	5.4	2	18	0.00	0
Teeth	11	19.6	11	100	0.92	46
Atlas	0	0.0	0	0	0.00	0
Axis	0	0.0	0	0	0.00	0
Cervical vertebrae 3-7	0	0.0	0	0	0.00	0
Thoracic vertebrae	0	0.0	0	0	0.00	0
Lumbar vertebrae	0	0.0	0	0	0.00	0
Sacrum/sacral vert.	0	0.0	0	0	0.00	0
Caudal vertebrae	0	0.0	0	0	0.00	0
Scapula	3	5.4	2	18	1.00	50
Sternum	0	0.0	0	0	0.00	0
Ribs	3	5.4	2	18	0.08	4
Humerus	4	7.1	2	18	1.00	50
Humerus (co.)	0	0.0	0	0	0.00	0
Humerus (prox.)	0	0.0	0	0	0.00	0
Humerus (shaft)	4	7.1	2	18	1.00	50
Humerus (dis.)	0	0.0	0	0	0.00	0
Radius	3	5.4	1	9	0.50	25
Radius (co.)	0	0.0	0	0	0.00	0
Radius (prox.)	0	0.0	0	0	0.00	0
Radius (shaft)	1	1.8	1	9	0.50	25
Radius (dis.)	2	3.6	1	9	0.50	25
Ulna	0	0.0	0	0	0.00	0
Ulna (co.)	0	0.0	0	0	0.00	0
Ulna (prox.)	0	0.0	0	0	0.00	0
Ulna (shaft)	0	0.0	0	0	0.00	0
Ulna (dis.)	0	0.0	0	0	0.00	0
Carpals	0	0.0	0	0	0.00	0
Metacarpal	3	5.4	2	18	0.18	9
Metacarpal (prox.)	1	1.8	1	9	0.09	5
Metacarpal (shaft)	0	0.0	0	0	0.00	0
Metacarpal (dis.)	2	3.6	1	9	0.50	25
Innominate	3	5.4	2	18	1.00	50
Femur	1	1.8	1	9	0.50	25
Femur (co.)	0	0.0	0	0	0.00	0
Femur (prox.)	0	0.0	0	0	0.00	0
Femur (shaft)	1	1.8	1	9	0.50	25
Femur (dis.)	0	0.0	0	0	0.00	0
Patella	0	0.0	0	0	0.00	0
Tibia	1	1.8	1	9	0.50	25
Tibia (co.)	0	0.0	0	0	0.00	0
Tibia (prox.)	0	0.0	0	0	0.00	0
Tibia (shaft)	0	0.0	0	0	0.00	0
Tibia (dis.)	1	1.8	1	9	0.50	25
Fibula	0	0.0	0	0	0.00	0
Tarsals	0	0.0	0	0	0.00	0
Metatarsal	5	8.9	4	36	2.00	100
Metatarsal (prox. + shaft)	1	1.8	1	9	0.50	25
Metatarsal (shaft)	3	5.4	3	27	1.50	75
Metatarsal (dis.)	1	1.8	1	9	0.50	25
Phalanges 1	0	0.0	0	0	0.00	0
Phalanges 2	0	0.0	0	0	0.00	0
Phalanges 3	0	0.0	0	0	0.00	0
Vertebrae (unid.)	4	7.1	-	-	-	-
TOTAL	56	100.0				

Table 13 Ohituk site (KcFr-3A): Foetal/newborn small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.00	0.0
Mandible	0	0.0	0	0	0.00	0.0
Maxilla	0	0.0	0	0	0.00	0.0
Teeth	0	0.0	0	0	0.00	0.0
Atlas	0	0.0	0	0	0.00	0.0
Axis	0	0.0	0	0	0.00	0.0
Cervical vertebrae 3-7	0	0.0	0	0	0.00	0.0
Thoracic vertebrae	0	0.0	0	0	0.00	0.0
Lumbar vertebrae	0	0.0	0	0	0.00	0.0
Sacral vertebrae	0	0.0	0	0	0.00	0.0
Caudal vertebrae	0	0.0	0	0	0.00	0.0
Scapula	0	0.0	0	0	0.00	0.0
Sternum	0	0.0	0	0	0.00	0.0
Ribs	0	0.0	0	0	0.00	0.0
Humerus	0	0.0	0	0	0.00	0.0
Radius	0	0.0	0	0	0.00	0.0
Ulna	0	0.0	0	0	0.00	0.0
Carpals	1	16.7	1	100	0.08	16.7
Metacarpals	0	0.0	0	0	0.00	0.0
F. Phalanges	0	0.0	0	0	0.00	0.0
Baculum	0	0.0	0	0	0.00	0.0
Innominate	0	0.0	0	0	0.00	0.0
Femur	0	0.0	0	0	0.00	0.0
Patella	0	0.0	0	0	0.00	0.0
Tibia	1	16.7	1	100	0.50	100.0
Fibula	0	0.0	0	0	0.00	0.0
Astragalus	0	0.0	0	0	0.00	0.0
Calcaneum	1	16.7	1	100	0.50	100.0
Other tarsals	0	0.0	0	0	0.00	0.0
Metatarsals	1	16.7	1	100	0.10	20.0
H. Phalanges	1	16.7	1	100	0.04	7.1
Vertebra (unid.)	1	16.7	-	-	-	-
TOTAL	6	100.0				

Table 14 Ohituk site (KcFr-3A): Juvenile small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0.0
Maxilla	0	0.0	0	0	0.0	0.0
Mandible	8	3.0	7	29	3.5	35.0
Teeth	8	3.0	8	33	0.4	4.4
Atlas	0	0.0	0	0	0.0	0.0
Axis	1	0.4	1	4	1.0	10.0
Cervical vertebrae 3-7	0	0.0	0	0	0.0	0.0
Thoracic vertebrae	2	0.7	2	8	0.1	1.3
Lumbar vertebrae	0	0.0	0	0	0.0	0.0
Sacral vertebra 1	0	0.0	0	0	0.0	0.0
Other sacral vertebrae	0	0.0	0	0	0.0	0.0
Caudal vertebrae	2	0.7	2	8	0.2	1.7
Scapula	6	2.2	3	13	1.5	15.0
Sternum	0	0.0	0	0	0.0	0.0
Ribs	10	3.7	10	42	0.7	6.7
Humerus	36	13.4	20	83	10.0	100.0
Humerus (co.)	6	2.2	6	25	3.0	30.0
Humerus (prox. + shaft)	1	0.4	1	25	0.5	5.0
Humerus (shaft)	6	2.2	6	25	3.0	30.0
Humerus (dis.)	2	0.7	2	8	1.0	10.0
Humerus (dis. + shaft)	7	2.6	7	29	3.5	35.0
Humerus (epiphysis, prox.)	4	1.5	4	17	2.0	20.0
Humerus (epiphysis, dis.)	10	3.7	10	42	5.0	50.0
Radius	12	4.5	9	38	4.5	45.0
Radius (co.)	3	1.1	3	13	1.5	15.0
Radius (prox. + shaft)	3	1.1	3	13	1.5	15.0
Radius (shaft)	3	1.1	3	13	1.5	15.0
Radius (dis.)	1	0.4	1	4	0.5	5.0
Radius (epiphysis, prox.)	2	0.7	2	8	1.0	10.0
Radius (epiphysis, dis.)	0	0.0	0	0	0.0	0.0
Ulna	7	2.6	5	21	2.5	25.0
Ulna (co.)	1	0.4	1	4	0.5	5.0
Ulna (prox.)	2	0.7	2	8	1.0	10.0
Ulna (prox. + shaft)	2	0.7	2	8	1.0	10.0
Ulna (shaft)	2	0.7	2	8	1.0	10.0
Ulna (dis.)	0	0.0	0	0	0.0	0.0
Ulna (epiphysis, prox.)	0	0.0	0	0	0.0	0.0
Ulna (epiphysis, dis.)	0	0.0	0	0	0.0	0.0
Carpals	3	1.1	3	13	0.3	2.5
Metacarpals	12	4.5	12	50	1.2	12.0
F. Phalanges	14	5.2	13	54	0.4	4.3
Baculum	0	0.0	0	0	0.0	0.0
Innominate	10	3.7	6	25	3.0	30.0
Femur	19	7.1	16	67	8.0	80.0
Femur (co.)	3	1.1	3	13	1.5	15.0
Femur (prox. + shaft)	1	0.4	1	4	0.5	5.0
Femur (shaft)	11	4.1	11	46	5.5	55.0
Femur (dis. + shaft)	1	0.4	1	4	0.5	5.0
Femur (epiphysis, prox.)	0	0.0	0	0	0.0	0.0
Femur (epiphysis, dis.)	3	1.1	3	13	1.5	15.0
Patella	2	0.7	2	8	1.0	10.0

Table 14 (cont.) Ohituk site (KcFr-3A): Juvenile small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Tibia	26	9.7	17	71	8.5	85.0
Tibia (co.)	1	0.4	1	4	0.5	5.0
Tibia (prox.)	1	0.4	1	4	0.5	5.0
Tibia (prox. + shaft)	1	0.4	1	4	0.5	5.0
Tibia (shaft)	11	4.1	11	46	5.5	55.0
Tibia (dis. + shaft)	4	1.5	4	17	2.0	20.0
Tibia (epiphysis, prox.)	5	1.9	5	21	2.5	25.0
Tibia (epiphysis, dis.)	3	1.1	3	13	1.5	15.0
Fibula	13	4.9	7	29	3.5	35.0
Fibula (co.)	0	0.0	0	0	0.0	0.0
Fibula (prox.)	0	0.0	0	0	0.0	0.0
Fibula (shaft)	0	0.0	0	0	0.0	0.0
Fibula (dis.)	2	0.7	2	8	1.0	10.0
Fibula (dis. + shaft)	5	1.9	5	21	2.5	25.0
Fibula (epiphysis, prox.)	0	0.0	0	0	0.0	0.0
Fibula (epiphysis, dis.)	6	2.2	6	25	3.0	30.0
Astragalus	2	0.7	2	8	1.0	10.0
Calcaneum	4	1.5	4	17	2.0	20.0
Other tarsals	15	5.6	15	63	1.3	12.5
Metatarsals	26	9.7	23	96	2.3	23.0
H. Phalanges	26	9.7	24	100	0.9	8.6
Phalanges (unid.)	3	1.1				
Vertebrae (unid.)	1	0.4	–	–	–	–
TOTAL	268	100.0				

Table 15 Ohituk site (KcFr-3A): Subadult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0
Maxilla	0	0.0	0	0	0.0	0
Mandible	0	0.0	0	0	0.0	0
Teeth	1	0.3	1	6	0.1	1
Atlas	0	0.0	0	0	0.0	0
Axis	2	0.6	2	13	2.0	25
Cervical vertebrae 3-7	10	3.2	8	50	1.6	20
Thoracic vertebrae	10	3.2	10	63	0.7	8
Lumbar vertebrae	13	4.2	13	81	2.6	33
Sacral vertebra 1	4	1.3	4	25	4.0	50
Other sacral vertebrae	7	2.3	7	44	2.3	29
Caudal vertebrae	17	5.5	17	106	1.4	18
Scapula	0	0.0	0	0	0.0	0
Sternum	0	0.0	0	0	0.0	0
Ribs	14	4.5	14	88	0.9	12
Humerus	37	11.9	16	100	8.0	100
Humerus (co.)	6	1.9	6	38	3.0	38
Humerus (prox.)	0	0.0	0	0	0.0	0
Humerus (shaft)	0	0.0	0	0	0.0	0
Humerus (dis.)	1	0.3	1	6	0.5	6
Humerus (dis. + shaft)	5	1.6	5	31	2.5	31
Humerus (epiphysis, prox.)	16	5.1	16	100	8.0	100
Humerus (epiphysis, dis.)	9	2.9	9	56	4.5	56
Radius	19	6.1	10	63	5.0	63
Radius (co.)	5	1.6	5	31	2.5	31
Radius (prox.)	1	0.3	1	6	0.5	6
Radius (prox. + shaft)	4	1.3	4	25	2.0	25
Radius (shaft)	1	0.3	1	6	0.5	6
Radius (dis.)	0	0.0	0	0	0.0	0
Radius (epiphysis, prox.)	4	1.3	4	25	2.0	25
Radius (epiphysis, dis.)	4	1.3	4	25	2.0	25
Ulna	6	1.9	6	38	3.0	38
Ulna (co.)	2	0.6	2	13	1.0	13
Ulna (prox. + shaft)	4	1.3	4	25	2.0	25
Ulna (shaft)	0	0.0	0	0	0.0	0
Ulna (dis.)	0	0.0	0	0	0.0	0
Ulna (epiphysis, prox.)	0	0.0	0	0	0.0	0
Ulna (epiphysis, dis.)	0	0.0	0	0	0.0	0
Carpals	0	0.0	0	0	0.0	0
Metacarpals	3	1.0	3	19	0.3	4
F. Phalanges	10	3.2	10	63	0.3	4
Baculum	0	0.0	0	0	0.0	0
Innominate	0	0.0	0	0	0.0	0
Femur	29	9.3	12	75	6.0	75
Femur (co.)	3	1.0	3	19	1.5	19
Femur (prox.)	2	0.6	2	13	1.0	13
Femur (prox. + shaft)	5	1.6	5	31	2.5	31
Femur (shaft)	0	0.0	0	0	0.0	0
Femur (dis.)	0	0.0	0	0	0.0	0
Femur (epiphysis, prox.)	7	2.3	7	44	3.5	44
Femur (epiphysis, dis.)	12	3.9	12	75	6.0	75
Patella	1	0.3	1	6	0.5	6

Table 15 (cont.) Ohituk site (KcFr-3A): Subadult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Tibia	22	7.1	13	81	6.5	81
Tibia (co.)	1	0.3	1	6	0.5	6
Tibia (prox. + shaft)	1	0.3	1	6	0.5	6
Tibia (shaft)	1	0.3	1	6	0.5	6
Tibia (dis.)	1	0.3	1	6	0.5	6
Tibia (dis. + shaft)	2	0.6	2	13	1.0	13
Tibia (epiphysis, prox.)	13	4.2	13	81	6.5	81
Tibia (epiphysis, dis.)	3	1.0	3	19	1.5	19
Fibula	4	1.3	4	25	2.0	25
Fibula (co.)	0	0.0	0	0	0.0	0
Fibula (prox.)	0	0.0	0	0	0.0	0
Fibula (shaft)	0	0.0	0	0	0.0	0
Fibula (dis. + shaft)	2	0.6	2	13	1.0	13
Fibula (epiphysis, prox.)	0	0.0	0	0	0.0	0
Fibula (epiphysis, dis.)	2	0.6	2	13	1.0	13
Astragalus	0	0.0	0	0	0.0	0
Calcaneum	0	0.0	0	0	0.0	0
Other tarsals	1	0.3	1	6	0.1	1
Metatarsals	8	2.6	5	31	0.5	6
H. Phalanges	14	4.5	13	81	0.5	6
Phalanges (unid.)	1	0.3	–	–	–	–
Vertebrae (unid.)	78	25.1	–	–	–	–
TOTAL	311	100.0				

Table 16 Ohituk site (KcFr-3A): Adult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0
Maxilla	0	0.0	0	0	0.0	0
Mandible	1	2.4	1	17	0.5	25
Teeth	0	0.0	0	0	0.0	0
Atlas	0	0.0	0	0	0.0	0
Axis	0	0.0	0	0	0.0	0
Cervical vertebrae 3-7	4	9.8	4	67	0.8	40
Thoracic vertebrae	1	2.4	1	17	0.1	3
Lumbar vertebrae	0	0.0	0	0	0.0	0
Sacrum (fused)	0	0.0	0	0	0.0	0
Caudal vertebrae	0	0.0	0	0	0.0	0
Scapula	0	0.0	0	0	0.0	0
Sternum	0	0.0	0	0	0.0	0
Ribs	1	2.4	1	17	0.1	3
Humerus	2	4.9	2	33	1.0	50
Humerus (co.)	2	4.9	2	33	1.0	50
Radius	1	2.4	1	17	0.5	25
Radius (prox. + shaft)	1	2.4	1	17	0.5	25
Ulna	1	2.4	1	17	0.5	25
Ulna (prox. + shaft)	1	2.4	1	17	0.5	25
Carpals	0	0.0	0	0	0.0	0
Metacarpals	1	2.4	1	17	0.1	5
F. Phalanges	5	12.2	5	83	0.2	8
Baculum	0	0.0	0	0	0.0	0
Innominate	0	0.0	0	0	0.0	0
Femur	5	12.2	4	67	2.0	100
Femur (co.)	2	4.9	2	33	1.0	50
Femur (prox.)	1	2.4	1	17	0.5	25
Femur (shaft)	0	0.0	0	0	0.0	0
Femur (dis.)	1	2.4	1	17	0.5	25
Femur (dis. + shaft)	1	2.4	1	17	0.5	25
Patella	0	0.0	0	0	0.0	0
Tibia	0	0.0	0	0	0.0	0
Fibula	1	2.4	1	17	0.5	25
Fibula (dis. + shaft)	1	2.4	1	17	0.5	25
Astragalus	0	0.0	0	0	0.0	0
Calcaneum	0	0.0	0	0	0.0	0
Other tarsals	1	2.4	1	17	0.1	4
Metatarsals	6	14.6	6	100	0.6	30
H. Phalanges	6	14.6	6	100	0.2	11
Vertebrae (unid.)	5	12.2	–	–	–	–
TOTAL	41	100.0				

Table 17 Ohituk site (KcFr-3A): Subadult or adult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	89	13.8	22	88.0	11.0	100.0
Maxilla	3	0.5	2	8.0	1.0	9.1
Mandible	7	1.1	6	24.0	3.0	27.3
Teeth	19	2.9	19	76.0	1.1	9.6
Atlas	20	3.1	7	28.0	7.0	63.6
Axis	5	0.8	5	20.0	5.0	45.5
Cervical vertebrae 3-7	0	0.0	0	0.0	0.0	0.0
Thoracic vertebrae	1	0.2	1	4.0	0.1	0.6
Lumbar vertebrae	1	0.2	1	4.0	0.2	1.8
Sacrum (fused)	1	0.2	1	4.0	1.0	9.1
Caudal vertebrae	4	0.6	3	12.0	0.3	2.3
Scapula	24	3.7	10	40.0	5.0	45.5
Sternum	4	0.6	1	4.0	0.1	1.0
Ribs	183	28.4	25	100.0	1.7	15.2
Humerus	5	0.8	5	20.0	2.5	22.7
Humerus (co.)	0	0.0	0	0.0	0.0	0.0
Humerus (prox. + shaft)	1	0.2	1	4.0	0.5	4.5
Humerus (shaft)	4	0.6	4	16.0	2.0	18.2
Humerus (dis.)	0	0.0	0	0.0	0.0	0.0
Radius	1	0.2	1	4.0	0.5	4.5
Radius (co.)	0	0.0	0	0.0	0.0	0.0
Radius (prox.)	0	0.0	0	0.0	0.0	0.0
Radius (shaft)	1	0.2	1	4.0	0.5	4.5
Radius (dis.)	0	0.0	0	0.0	0.0	0.0
Ulna	12	1.9	12	48.0	6.0	54.5
Ulna (co.)	0	0.0	0	0.0	0.0	0.0
Ulna (prox.)	1	0.2	1	4.0	0.5	4.5
Ulna (prox. + shaft)	1	0.2	1	4.0	0.5	4.5
Ulna (shaft)	10	1.6	10	40.0	5.0	45.5
Ulna (dis.)	0	0.0	0	0.0	0.0	0.0
Carpals	7	1.1	7	28.0	0.6	5.3
Metacarpals	2	0.3	2	8.0	0.2	1.8
F. Phalanges	2	0.3	2	8.0	0.1	0.6
Baculum	0	0.0	0	0.0	0.0	0.0
Innominate	44	6.8	21	84.0	10.5	95.5
Femur	11	1.7	11	44.0	5.5	50.0
Femur (co.)	0	0.0	0	0.0	0.0	0.0
Femur (prox. + shaft)	3	0.5	3	12.0	1.5	13.6
Femur (shaft)	7	1.1	7	28.0	3.5	31.8
Femur (dis. + shaft)	1	0.2	1	4.0	0.5	4.5
Patella	5	0.8	5	20.0	2.5	22.7
Tibia	5	0.8	5	20.0	2.5	22.7
Tibia (co.)	0	0.0	0	0.0	0.0	0.0
Tibia (prox.)	0	0.0	0	0.0	0.0	0.0
Tibia (shaft)	5	0.8	5	20.0	2.5	22.7
Tibia (dis.)	0	0.0	0	0.0	0.0	0.0
Fibula	3	0.5	3	12.0	1.5	13.6
Fibula (shaft)	3	0.5	3	12.0	1.5	13.6
Astragalus	4	0.6	4	16.0	2.0	18.2
Calcaneum	4	0.6	4	16.0	2.0	18.2
Other tarsals	11	1.7	11	44.0	0.9	8.3
Metatarsals	11	1.7	11	44.0	1.1	10.0
H. Phalanges	10	1.6	10	40.0	0.4	3.2
Phalanges (unid.)	2	0.3	–	–	–	–
Vertebrae (unid.)	145	22.5	–	–	–	–
TOTAL	645	100.0				

Table 18 Ohituk site (KcFr-3A): Small seal skeletal parts (all ages)

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	89	7.0	22	40.7	11.0	51.2
Maxilla	3	0.2	2	3.7	1.0	4.7
Mandible	16	1.3	14	25.9	7.0	32.6
Teeth	28	2.2	28	51.9	1.6	7.2
Atlas	20	1.6	7	13.0	7.0	32.6
Axis	8	0.6	8	14.8	8.0	37.2
Cervical vertebrae 3-7	14	1.1	12	22.2	2.4	11.2
Thoracic vertebrae	14	1.1	14	25.9	0.9	4.3
Lumbar vertebrae	14	1.1	14	25.9	2.8	13.0
Sacral vertebra 1	4	0.3	4	7.4	4.0	18.6
Other sacral vertebrae	7	0.6	7	13.0	2.3	10.9
Sacrum (fused)	1	0.1	1	1.9	1.0	4.7
Caudal vertebrae	23	1.8	21	38.9	1.8	8.1
Scapula	30	2.4	13	24.1	6.5	30.2
Sternum	4	0.3	1	1.9	0.1	0.5
Ribs	208	16.4	50	92.6	3.3	15.5
Humerus	80	6.3	43	79.6	21.5	100.0
Humerus (co.)	14	1.1	14	25.9	7.0	32.6
Humerus (prox. + shaft)	2	0.2	2	3.7	1.0	4.7
Humerus (shaft)	10	0.8	10	18.5	5.0	23.3
Humerus (dis.)	3	0.2	3	5.6	1.5	7.0
Humerus (dis. + shaft)	12	0.9	12	22.2	6.0	27.9
Humerus (epiphysis, prox.)	20	1.6	20	37.0	10.0	46.5
Humerus (epiphysis, dis.)	19	1.5	19	35.2	9.5	44.2
Radius	33	2.6	21	38.9	10.5	48.8
Radius (co.)	8	0.6	8	14.8	4.0	18.6
Radius (prox.)	1	0.1	1	1.9	0.5	2.3
Radius (prox. + shaft)	8	0.6	8	14.8	4.0	18.6
Radius (shaft)	5	0.4	5	9.3	2.5	11.6
Radius (dis.)	1	0.1	1	1.9	0.5	2.3
Radius (epiphysis, prox.)	6	0.5	6	11.1	3.0	14.0
Radius (epiphysis, dis.)	4	0.3	4	7.4	2.0	9.3
Ulna	26	2.0	24	44.4	12.0	55.8
Ulna (co.)	3	0.2	3	5.6	1.5	7.0
Ulna (prox.)	3	0.2	3	5.6	1.5	7.0
Ulna (prox. + shaft)	8	0.6	8	14.8	4.0	18.6
Ulna (shaft)	12	0.9	12	22.2	6.0	27.9
Ulna (dis.)	0	0.0	0	0.0	0.0	0.0
Ulna (epiphysis, prox.)	0	0.0	0	0.0	0.0	0.0
Ulna (epiphysis, dis.)	0	0.0	0	0.0	0.0	0.0
Carpals	11	0.9	11	20.4	0.9	4.3
Metacarpals	18	1.4	18	33.3	1.8	8.4
F. Phalanges	31	2.4	30	55.6	1.0	4.7
Baculum	0	0.0	0	0.0	0.0	0.0
Innominate	54	4.2	27	50.0	13.5	62.8
Femur	64	5.0	43	79.6	21.5	100.0
Femur (co.)	8	0.6	8	14.8	4.0	18.6
Femur (prox.)	3	0.2	3	5.6	1.5	7.0
Femur (prox. + shaft)	9	0.7	9	16.7	4.5	20.9
Femur (shaft)	18	1.4	18	33.3	9.0	41.9
Femur (dis.)	1	0.1	1	1.9	0.5	2.3
Femur (dis. + shaft)	3	0.2	3	5.6	1.5	7.0
Femur (epiphysis, prox.)	7	0.6	7	13.0	3.5	16.3
Femur (epiphysis, dis.)	15	1.2	15	27.8	7.5	34.9
Patella	8	0.6	8	14.8	4.0	18.6

Table 18 Ohituk site (KcFr-3A): Small seal skeletal parts (all ages)

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Tibia	54	4.2	36	66.7	18.0	83.7
Tibia (co.)	2	0.2	2	3.7	1.0	4.7
Tibia (prox.)	1	0.1	1	1.9	0.5	2.3
Tibia (prox. + shaft)	2	0.2	2	3.7	1.0	4.7
Tibia (shaft)	18	1.4	18	33.3	9.0	41.9
Tibia (dis.)	1	0.1	1	1.9	0.5	2.3
Tibia (dis. + shaft)	6	0.5	6	11.1	3.0	14.0
Tibia (epiphysis, prox.)	18	1.4	18	33.3	9.0	41.9
Tibia (epiphysis, dis.)	6	0.5	6	11.1	3.0	14.0
Fibula	21	1.7	15	27.8	7.5	34.9
Fibula (co.)	0	0.0	0	0.0	0.0	0.0
Fibula (prox.)	0	0.0	0	0.0	0.0	0.0
Fibula (shaft)	3	0.2	3	5.6	1.5	7.0
Fibula (dis.)	2	0.2	2	3.7	1.0	4.7
Fibula (dis. + shaft)	8	0.6	8	14.8	4.0	18.6
Fibula (epiphysis, prox.)	0	0.0	0	0.0	0.0	0.0
Fibula (epiphysis, dis.)	8	0.6	8	14.8	4.0	18.6
Astragalus	6	0.5	6	11.1	3.0	14.0
Calcaneum	9	0.7	9	16.7	4.5	20.9
Other tarsals	28	2.2	28	51.9	2.3	10.9
Metatarsals	52	4.1	46	85.2	4.6	21.4
H. Phalanges	57	4.5	54	100.0	1.9	9.0
Phalanges (unid.)	6	0.5	–	–	–	–
Vertebrae (unid.)	230	18.1	–	–	–	–
TOTAL	1271	100.0				

Table 19 Ohituk site (KcFr-3A): Altered faunal remains

Bone alterations	N	% of altered bones	% of all bones (N=1785)
splintered and/or undiagnostic gnawing marks	1144	71.32	64.09
spiral fracture	394	24.56	22.07
burnt	35	2.18	1.96
worked	21	1.31	1.18
carnivore chewed	7	0.44	0.39
cut marks	3	0.19	0.17
TOTAL	1604	100.00	89.86

Table 20 Tivi Paningayak site (KcFr-8A): Foetal/newborn small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.00	0.0
Maxilla	0	0.0	0	0	0.00	0.0
Mandible	0	0.0	0	0	0.00	0.0
Teeth	0	0.0	0	0	0.00	0.0
Atlas	0	0.0	0	0	0.00	0.0
Axis	0	0.0	0	0	0.00	0.0
Cervical vertebrae 3-7	0	0.0	0	0	0.00	0.0
Thoracic vertebrae	0	0.0	0	0	0.00	0.0
Lumbar vertebrae	0	0.0	0	0	0.00	0.0
Sacral vertebrae	0	0.0	0	0	0.00	0.0
Caudal vertebrae	2	25.0	2	50	0.50	100.0
Scapula	0	0.0	0	0	0.00	0.0
Sternum	0	0.0	0	0	0.00	0.0
Ribs	0	0.0	0	0	0.00	0.0
Humerus	0	0.0	0	0	0.00	0.0
Radius	0	0.0	0	0	0.00	0.0
Ulna	0	0.0	0	0	0.00	0.0
Carpals	0	0.0	0	0	0.00	0.0
Metacarpals	1	12.5	1	25	0.10	20.0
F. Phalanges	0	0.0	0	0	0.00	0.0
Baculum	0	0.0	0	0	0.00	0.0
Innominate	0	0.0	0	0	0.00	0.0
Femur	0	0.0	0	0	0.00	0.0
Patella	0	0.0	0	0	0.00	0.0
Tibia	0	0.0	0	0	0.00	0.0
Fibula	0	0.0	0	0	0.00	0.0
Astragalus	0	0.0	0	0	0.00	0.0
Calcaneum	0	0.0	0	0	0.00	0.0
Other tarsals	0	0.0	0	0	0.00	0.0
Metatarsals	0	0.0	0	0	0.00	0.0
H. Phalanges	4	50.0	4	100	0.14	28.6
Metapodial (unid.)	1	12.5	–	–	–	–
TOTAL	8	100.0				

Table 21 Tivi Paningayak site (KcFr-8A): Juvenile small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0.0
Maxilla	0	0.0	0	0	0.0	0.0
Mandible	6	1.7	6	17	3.0	35.3
Teeth	1	0.3	1	3	0.1	0.7
Atlas	0	0.0	0	0	0.0	0.0
Axis	1	0.3	1	3	1.0	11.8
Cervical vertebrae 3-7	5	1.4	5	14	1.0	11.8
Thoracic vertebrae	11	3.1	11	31	0.7	8.6
Lumbar vertebrae	0	0.0	0	0	0.0	0.0
Sacral vertebra 1	4	1.1	4	11	4.0	47.1
Other sacral vertebrae	11	3.1	10	28	3.3	39.2
Caudal vertebrae	4	1.1	4	11	0.3	3.9
Scapula	1	0.3	1	3	0.5	5.9
Sternum	7	2.0	7	19	0.8	9.2
Ribs	10	2.8	10	28	0.7	7.8
Humerus	39	11.0	17	47	8.5	100.0
Humerus (co.)	6	1.7	6	17	3.0	35.3
Humerus (prox.)	2	0.6	2	6	1.0	11.8
Humerus (prox. + shaft)	1	0.3	1	3	0.5	5.9
Humerus (shaft)	4	1.1	4	11	2.0	23.5
Humerus (dis.)	1	0.3	1	3	0.5	5.9
Humerus (dis. + shaft)	6	1.7	6	17	3.0	35.3
Humerus (epiphysis, prox.)	8	2.2	8	22	4.0	47.1
Humerus (epiphysis, dis.)	11	3.1	11	31	5.5	64.7
Radius	20	5.6	8	22	4.0	47.1
Radius (co.)	4	1.1	4	11	2.0	23.5
Radius (prox. + shaft)	1	0.3	1	3	0.5	5.9
Radius (shaft)	2	0.6	2	6	1.0	11.8
Radius (dis.)	0	0.0	0	0	0.0	0.0
Radius (epiphysis, prox.)	8	2.2	8	22	4.0	47.1
Radius (epiphysis, dis.)	5	1.4	5	14	2.5	29.4
Ulna	12	3.4	9	25	4.5	52.9
Ulna (co.)	2	0.6	2	6	1.0	11.8
Ulna (prox. + shaft)	3	0.8	3	8	1.5	17.6
Ulna (shaft)	3	0.8	3	8	1.5	17.6
Ulna (dis. + shaft)	1	0.3	1	3	0.5	5.9
Ulna (epiphysis, prox.)	0	0.0	0	0	0.0	0.0
Ulna (epiphysis, dis.)	3	0.8	3	8	1.5	17.6
Carpals	5	1.4	5	14	0.4	4.9
Metacarpals	24	6.7	24	67	2.4	28.2
F. Phalanges	23	6.5	23	64	0.8	9.0
Baculum	0	0.0	0	0	0.0	0.0
Innominate	8	2.2	8	22	4.0	47.1
Femur	8	2.2	3	8	1.5	17.6
Femur (co.)	1	0.3	1	3	0.5	5.9
Femur (prox.)	0	0.0	0	0	0.0	0.0
Femur (shaft)	1	0.3	1	3	0.5	5.9
Femur (dis.)	1	0.3	1	3	0.5	5.9
Femur (dis. + shaft)	1	0.3	1	3	0.5	5.9
Femur (epiphysis, prox.)	2	0.6	2	6	1.0	11.8
Femur (epiphysis, dis.)	2	0.6	2	6	1.0	11.8
Patella	1	0.3	1	3	0.5	5.9

Table 21 (cont.) Tivi Paningayak site (KcFr-8A): Juvenile small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Tibia	13	3.7	7	19	3.5	41.2
Tibia (co.)	0	0.0	0	0	0.0	0.0
Tibia (prox.)	1	0.3	1	3	0.5	5.9
Tibia (shaft)	6	1.7	6	17	3.0	35.3
Tibia (dis.)	1	0.3	1	3	0.5	5.9
Tibia (dis. + shaft)	1	0.3	1	3	0.5	5.9
Tibia (epiphysis, prox.)	2	0.6	2	6	1.0	11.8
Tibia (epiphysis, dis.)	2	0.6	2	6	1.0	11.8
Fibula	3	0.8	2	6	1.0	11.8
Fibula (co.)	0	0.0	0	0	0.0	0.0
Fibula (prox.)	0	0.0	0	0	0.0	0.0
Fibula (shaft)	0	0.0	0	0	0.0	0.0
Fibula (dis. + shaft)	1	0.3	1	3	0.5	5.9
Fibula (epiphysis, prox.)	0	0.0	0	0	0.0	0.0
Fibula (epiphysis, dis.)	2	0.6	2	6	1.0	11.8
Astragalus	0	0.0	0	0	0.0	0.0
Calcaneum	2	0.6	2	6	1.0	11.8
Other tarsals	7	2.0	7	19	0.6	6.9
Metatarsals	13	3.7	8	22	0.8	9.4
H. Phalanges	38	10.7	36	100	1.3	15.1
Phalanges (unid.)	8	2.2				
Vertebrae (unid.)	71	19.9	–	–	–	–
TOTAL	356	100.0				

Table 22 Tivi Paningayak site (KcFr-8A): Subadult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0
Maxilla	0	0.0	0	0	0.0	0
Mandible	0	0.0	0	0	0.0	0
Teeth	0	0.0	0	0	0.0	0
Atlas	0	0.0	0	0	0.0	0
Axis	2	1.0	2	8	2.0	17
Cervical vertebrae 3-7	2	1.0	2	8	0.4	3
Thoracic vertebrae	11	5.5	11	46	0.7	6
Lumbar vertebrae	10	5.0	10	42	2.0	17
Sacral vertebra 1	4	2.0	4	17	4.0	33
Other sacral vertebrae	6	3.0	6	25	2.0	17
Caudal vertebrae	2	1.0	2	8	0.2	1
Scapula	0	0.0	0	0	0.0	0
Sternum	0	0.0	0	0	0.0	0
Ribs	10	5.0	10	42	0.7	6
Humerus	41	20.6	24	100	12.0	100
Humerus (co.)	7	3.5	7	29	3.5	29
Humerus (prox.)	1	0.5	1	4	0.5	4
Humerus (prox. + shaft)	3	1.5	3	13	1.5	13
Humerus (shaft)	3	1.5	3	13	1.5	13
Humerus (dis.)	2	1.0	2	8	1.0	8
Humerus (dis. + shaft)	11	5.5	11	46	5.5	46
Humerus (epiphysis, prox.)	12	6.0	12	50	6.0	50
Humerus (epiphysis, dis.)	2	1.0	2	8	1.0	8
Radius	6	3.0	3	13	1.5	13
Radius (co.)	2	1.0	2	8	1.0	8
Radius (prox.)	2	1.0	2	8	1.0	8
Radius (shaft)	0	0.0	0	0	0.0	0
Radius (dis. + shaft)	1	0.5	1	4	0.5	4
Radius (epiphysis, prox.)	1	0.5	1	4	0.5	4
Radius (epiphysis, dis.)	0	0.0	0	0	0.0	0
Ulna	8	4.0	6	25	3.0	25
Ulna (co.)	0	0.0	0	0	0.0	0
Ulna (prox.)	2	1.0	2	8	1.0	8
Ulna (prox. + shaft)	3	1.5	3	13	1.5	13
Ulna (shaft)	0	0.0	0	0	0.0	0
Ulna (dis.)	1	0.5	1	4	0.5	4
Ulna (dis. + shaft)	1	0.5	1	4	0.5	4
Ulna (epiphysis, prox.)	1	0.5	1	4	0.5	4
Ulna (epiphysis, dis.)	0	0.0	0	0	0.0	0
Carpals	0	0.0	0	0	0.0	0
Metacarpals	3	1.5	2	8	0.2	2
F. Phalanges	3	1.5	3	13	0.1	1
Baculum	0	0.0	0	0	0.0	0
Innominate	0	0.0	0	0	0.0	0
Femur	23	11.6	15	63	7.5	63
Femur (co.)	4	2.0	4	17	2.0	17
Femur (prox. + shaft)	6	3.0	6	25	3.0	25
Femur (shaft)	0	0.0	0	0	0.0	0
Femur (dis. + shaft)	5	2.5	5	21	2.5	21
Femur (epiphysis, prox.)	2	1.0	2	8	1.0	8
Femur (epiphysis, dis.)	6	3.0	6	25	3.0	25
Patella	0	0.0	0	0	0.0	0

Table 22 (cont.) Tivi Paningayak site (KcFr-8A): Subadult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Tibia	15	7.5	7	29	3.5	29
Tibia (co.)	1	0.5	1	4	0.5	4
Tibia (prox.)	2	1.0	2	8	1.0	8
Tibia (prox. + shaft)	3	1.5	3	13	1.5	13
Tibia (shaft)	0	0.0	0	0	0.0	0
Tibia (dis. + shaft)	1	0.5	1	4	0.5	4
Tibia (epiphysis, prox.)	6	3.0	6	25	3.0	25
Tibia (epiphysis, dis.)	2	1.0	2	8	1.0	8
Fibula	5	2.5	3	13	1.5	13
Fibula (co.)	0	0.0	0	0	0.0	0
Fibula (prox.)	0	0.0	0	0	0.0	0
Fibula (shaft)	0	0.0	0	0	0.0	0
Fibula (dis.)	3	1.5	3	13	1.5	13
Fibula (epiphysis, prox.)	0	0.0	0	0	0.0	0
Fibula (epiphysis, dis.)	2	1.0	2	8	1.0	8
Astragalus	0	0.0	0	0	0.0	0
Calcaneum	1	0.5	1	4	0.5	4
Other tarsals	0	0.0	0	0	0.0	0
Metatarsals	5	2.5	5	21	0.5	4
H. Phalanges	5	2.5	5	21	0.2	1
Vertebrae (unid.)	37	18.6	-	-	-	-
TOTAL	199	100.0				

Table 23 Tivi Paningayak site (KcFr-8A): Adult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	0	0.0	0	0	0.0	0
Maxilla	0	0.0	0	0	0.0	0
Mandible	0	0.0	0	0	0.0	0
Teeth	0	0.0	0	0	0.0	0
Atlas	0	0.0	0	0	0.0	0
Axis	0	0.0	0	0	0.0	0
Cervical vertebrae 3-7	1	2.9	1	13	0.2	5
Thoracic vertebrae	7	20.0	7	88	0.5	12
Lumbar vertebrae	0	0.0	0	0	0.0	0
Sacrum (fused)	0	0.0	0	0	0.0	0
Caudal vertebrae	0	0.0	0	0	0.0	0
Scapula	0	0.0	0	0	0.0	0
Sternum	0	0.0	0	0	0.0	0
Ribs	1	2.9	1	13	0.1	2
Humerus	8	22.9	8	100	4.0	100
Humerus (co.)	3	8.6	3	38	1.5	38
Humerus (prox.)	1	2.9	1	13	0.5	13
Humerus (prox. + shaft)	1	2.9	1	13	0.5	13
Humerus (shaft)	0	0.0	0	0	0.0	0
Humerus (dis. + shaft)	3	8.6	3	38	1.5	38
Radius	4	11.4	4	50	2.0	50
Radius (co.)	1	2.9	1	13	0.5	13
Radius (prox.)	2	5.7	2	25	1.0	25
Radius (prox. + shaft)	1	2.9	1	13	0.5	13
Radius (shaft)	0	0.0	0	0	0.0	0
Radius (dis.)	0	0.0	0	0	0.0	0
Ulna	0	0.0	0	0	0.0	0
Carpals	0	0.0	0	0	0.0	0
Metacarpals	3	8.6	3	38	0.3	8
F. Phalanges	3	8.6	3	38	0.1	3
Baculum	0	0.0	0	0	0.0	0
Innominate	0	0.0	0	0	0.0	0
Femur	1	2.9	1	13	0.5	13
Femur (co.)	1	2.9	1	13	0.5	13
Femur (prox.)	0	0.0	0	0	0.0	0
Femur (shaft)	0	0.0	0	0	0.0	0
Femur (dis.)	0	0.0	0	0	0.0	0
Patella	0	0.0	0	0	0.0	0
Tibia	0	0.0	0	0	0.0	0
Fibula	0	0.0	0	0	0.0	0
Astragalus	0	0.0	0	0	0.0	0
Calcaneum	1	2.9	1	13	0.5	13
Other tarsals	0	0.0	0	0	0.0	0
Metatarsals	1	2.9	1	13	0.1	3
H. Phalanges	3	8.6	3	38	0.1	3
Vertebrae (unid.)	2	5.7	–	–	–	–
TOTAL	35	100.0				

Table 24 Tivi Paningayak site (KcFr-6A): Subadult or adult small seal skeletal parts

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	11	2.6	6	12.8	3.0	30.0
Maxilla	0	0.0	0	0.0	0.0	0.0
Mandible	8	1.9	7	14.9	3.5	35.0
Teeth	5	1.2	5	10.6	0.3	2.8
Atlas	10	2.3	5	10.6	5.0	50.0
Axis	3	0.7	3	6.4	3.0	30.0
Cervical vertebrae 3-7	0	0.0	0	0.0	0.0	0.0
Thoracic vertebrae	0	0.0	0	0.0	0.0	0.0
Lumbar vertebrae	0	0.0	0	0.0	0.0	0.0
Sacrum (fused)	1	0.2	1	2.1	1.0	10.0
Caudal vertebrae	0	0.0	0	0.0	0.0	0.0
Scapula	20	4.7	8	17.0	4.0	40.0
Sternum	13	3.0	13	27.7	1.4	14.4
Ribs	138	32.3	47	100.0	3.1	31.3
Humerus	8	1.9	8	17.0	4.0	40.0
Humerus (co.)	0	0.0	0	0.0	0.0	0.0
Humerus (prox.)	2	0.5	2	4.3	1.0	10.0
Humerus (shaft)	5	1.2	5	10.6	2.5	25.0
Humerus (dis.)	1	0.2	1	2.1	0.5	5.0
Radius	2	0.5	2	4.3	1.0	10.0
Radius (co.)	0	0.0	0	0.0	0.0	0.0
Radius (prox.)	0	0.0	0	0.0	0.0	0.0
Radius (shaft)	2	0.5	2	4.3	1.0	10.0
Radius (dis.)	0	0.0	0	0.0	0.0	0.0
Ulna	10	2.3	10	21.3	5.0	50.0
Ulna (co.)	0	0.0	0	0.0	0.0	0.0
Ulna (prox.)	0	0.0	0	0.0	0.0	0.0
Ulna (shaft)	10	2.3	10	21.3	5.0	50.0
Ulna (dis.)	0	0.0	0	0.0	0.0	0.0
Carpals	0	0.0	0	0.0	0.0	0.0
Metacarpals	4	0.9	4	8.5	0.4	4.0
F. Phalanges	6	1.4	6	12.8	0.2	2.0
Baculum	0	0.0	0	0.0	0.0	0.0
Innominate	36	8.4	20	42.6	10.0	100.0
Femur	7	1.6	7	14.9	3.5	35.0
Femur (co.)	0	0.0	0	0.0	0.0	0.0
Femur (prox.)	0	0.0	0	0.0	0.0	0.0
Femur (shaft)	7	1.6	7	14.9	3.5	35.0
Femur (dis.)	0	0.0	0	0.0	0.0	0.0
Patella	0	0.0	0	0.0	0.0	0.0
Tibia	8	1.9	8	17.0	4.0	40.0
Tibia (co.)	0	0.0	0	0.0	0.0	0.0
Tibia (prox.)	0	0.0	0	0.0	0.0	0.0
Tibia (shaft)	8	1.9	8	17.0	4.0	40.0
Tibia (dis.)	0	0.0	0	0.0	0.0	0.0
Fibula	1	0.2	1	2.1	0.5	5.0
Fibula (co.)	0	0.0	0	0.0	0.0	0.0
Fibula (prox.)	0	0.0	0	0.0	0.0	0.0
Fibula (shaft)	1	0.2	1	2.1	0.5	5.0
Fibula (dis.)	0	0.0	0	0.0	0.0	0.0
Astragalus	6	1.4	5	10.6	2.5	25.0
Calcaneum	2	0.5	2	4.3	1.0	10.0
Other tarsals	8	1.9	8	17.0	0.7	6.7
Metatarsals	11	2.6	11	23.4	1.1	11.0
H. Phalanges	5	1.2	5	10.6	0.2	1.8
Phalanges (unid.)	1	0.2	-	-	-	-
Vertebrae (unid.)	103	24.1	-	-	-	-
TOTAL	427	100.0				

Table 25 Tivi Paningayak site (KcFr-8A): Small seal skeletal parts (all ages)

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Cranium	11	1.1	6	8.8	3.0	14.0
Maxilla	0	0.0	0	0.0	0.0	0.0
Mandible	14	1.4	13	19.1	6.5	30.2
Teeth	6	0.6	6	8.8	0.3	1.6
Atlas	10	1.0	5	7.4	5.0	23.3
Axis	6	0.6	6	8.8	6.0	27.9
Cervical vertebrae 3-7	8	0.8	8	11.8	1.6	7.4
Thoracic vertebrae	29	2.8	29	42.6	1.9	9.0
Lumbar vertebrae	10	1.0	10	14.7	2.0	9.3
Sacral vertebra 1	8	0.8	8	11.8	8.0	37.2
Other sacral vertebrae	17	1.7	17	25.0	5.7	26.4
Sacrum (fused)	1	0.1	1	1.5	1.0	4.7
Caudal vertebrae	8	0.8	8	11.8	0.7	3.1
Scapula	21	2.0	9	13.2	4.5	20.9
Sternum	20	2.0	20	29.4	2.2	10.3
Ribs	159	15.5	68	100.0	4.5	21.1
Humerus	96	9.4	57	83.8	28.5	132.6
Humerus (co.)	16	1.6	16	23.5	8.0	37.2
Humerus (prox.)	6	0.6	6	8.8	3.0	14.0
Humerus (prox. + shaft)	5	0.5	5	7.4	2.5	11.6
Humerus (shaft)	12	1.2	12	17.6	6.0	27.9
Humerus (dis.)	4	0.4	4	5.9	2.0	9.3
Humerus (dis. + shaft)	20	2.0	20	29.4	10.0	46.5
Humerus (epiphysis, prox.)	20	2.0	20	29.4	10.0	46.5
Humerus (epiphysis, dis.)	13	1.3	13	19.1	6.5	30.2
Radius	32	3.1	17	25.0	8.5	39.5
Radius (co.)	7	0.7	7	10.3	3.5	16.3
Radius (prox.)	4	0.4	4	5.9	2.0	9.3
Radius (prox. + shaft)	2	0.2	1	1.5	0.5	2.3
Radius (shaft)	4	0.4	4	5.9	2.0	9.3
Radius (dis. + shaft)	1	0.1	1	1.5	0.5	2.3
Radius (epiphysis, prox.)	9	0.9	9	13.2	4.5	20.9
Radius (epiphysis, dis.)	5	0.5	5	7.4	2.5	11.6
Ulna	30	2.9	25	36.8	12.5	58.1
Ulna (co.)	2	0.2	2	2.9	1.0	4.7
Ulna (prox.)	2	0.2	2	2.9	1.0	4.7
Ulna (prox. + shaft)	6	0.6	6	8.8	3.0	14.0
Ulna (shaft)	13	1.3	13	19.1	6.5	30.2
Ulna (dis.)	1	0.1	1	1.5	0.5	2.3
Ulna (dis. + shaft)	2	0.2	2	2.9	1.0	4.7
Ulna (epiphysis, prox.)	1	0.1	1	1.5	0.5	2.3
Ulna (epiphysis, dis.)	3	0.3	3	4.4	1.5	7.0
Carpals	5	0.5	5	7.4	0.4	1.9
Metacarpals	35	3.4	34	50.0	3.4	15.8
F. Phalanges	35	3.4	35	51.5	1.2	5.4
Baculum	0	0.0	0	0.0	0.0	0.0
Innominate	44	4.3	28	41.2	14.0	65.1
Femur	39	3.8	31	45.6	15.5	72.1
Femur (co.)	6	0.6	6	8.8	3.0	14.0
Femur (prox. + shaft)	6	0.6	6	8.8	3.0	14.0
Femur (shaft)	8	0.8	8	11.8	4.0	18.6
Femur (dis.)	1	0.1	1	1.5	0.5	2.3
Femur (dis. + shaft)	6	0.6	6	8.8	3.0	14.0
Femur (epiphysis, prox.)	4	0.4	4	5.9	2.0	9.3
Femur (epiphysis, dis.)	8	0.8	8	11.8	4.0	18.6
Patella	1	0.1	1	1.5	0.5	2.3

Table 25 (cont.) Tivi Paningayak site (KcFr-8A): Small seal skeletal parts (all ages)

Skeletal parts	NISP	%NISP	MNE	%MNE	MAU	%MAU
Tibia	36	3.5	22	32.4	11.0	51.2
Tibia (co.)	1	0.1	1	1.5	0.5	2.3
Tibia (prox.)	3	0.3	3	4.4	1.5	7.0
Tibia (prox. + shaft)	3	0.3	3	4.4	1.5	7.0
Tibia (shaft)	14	1.4	14	20.6	7.0	32.6
Tibia (dis.)	1	0.1	1	1.5	0.5	2.3
Tibia (dis. + shaft)	2	0.2	2	2.9	1.0	4.7
Tibia (epiphysis, prox.)	8	0.8	8	11.8	4.0	18.6
Tibia (epiphysis, dis.)	4	0.4	4	5.9	2.0	9.3
Fibula	9	0.9	6	8.8	3.0	14.0
Fibula (co.)	0	0.0	0	0.0	0.0	0.0
Fibula (prox.)	0	0.0	0	0.0	0.0	0.0
Fibula (shaft)	1	0.1	1	1.5	0.5	2.3
Fibula (dis.)	3	0.3	3	4.4	1.5	7.0
Fibula (dis. + shaft)	1	0.1	1	1.5	0.5	2.3
Fibula (epiphysis, prox.)	0	0.0	0	0.0	0.0	0.0
Fibula (epiphysis, dis.)	4	0.4	4	5.9	2.0	9.3
Astragalus	6	0.6	5	7.4	2.5	11.6
Calcaneum	6	0.6	6	8.8	3.0	14.0
Other tarsals	15	1.5	15	22.1	1.3	5.8
Metatarsals	30	2.9	25	36.8	2.5	11.6
H. Phalanges	55	5.4	53	77.9	1.9	8.8
Metapodial	1	0.1				
Phalanges (unid.)	9	0.9	–	–	–	–
Vertebrae (unid.)	213	20.8	–	–	–	–
TOTAL	1025	100.0				

Table 26 Tivi Paningayak site (KcFr-8A): Altered faunal remains

Bone alterations	N	% of altered bones	% of all bones (N=1255)
splintered and/or undiagnostic gnawing marks	870	85.29	69.32
spiral fracture	124	12.16	9.88
carnivore chewed	13	1.27	1.04
worked	5	0.49	0.40
burnt	4	0.39	0.32
cut marks	4	0.39	0.32
TOTAL	1020	100.00	81.27

APPENDIX B

Photos of the archaeological sites from Ivujivik

Photo 1. Mangiuk site (KcFr-7): Facing west; north area in the foreground, northeast area in the background

Photo 2. Tivi Paningayak site, area B (KcFr-8B): Facing west

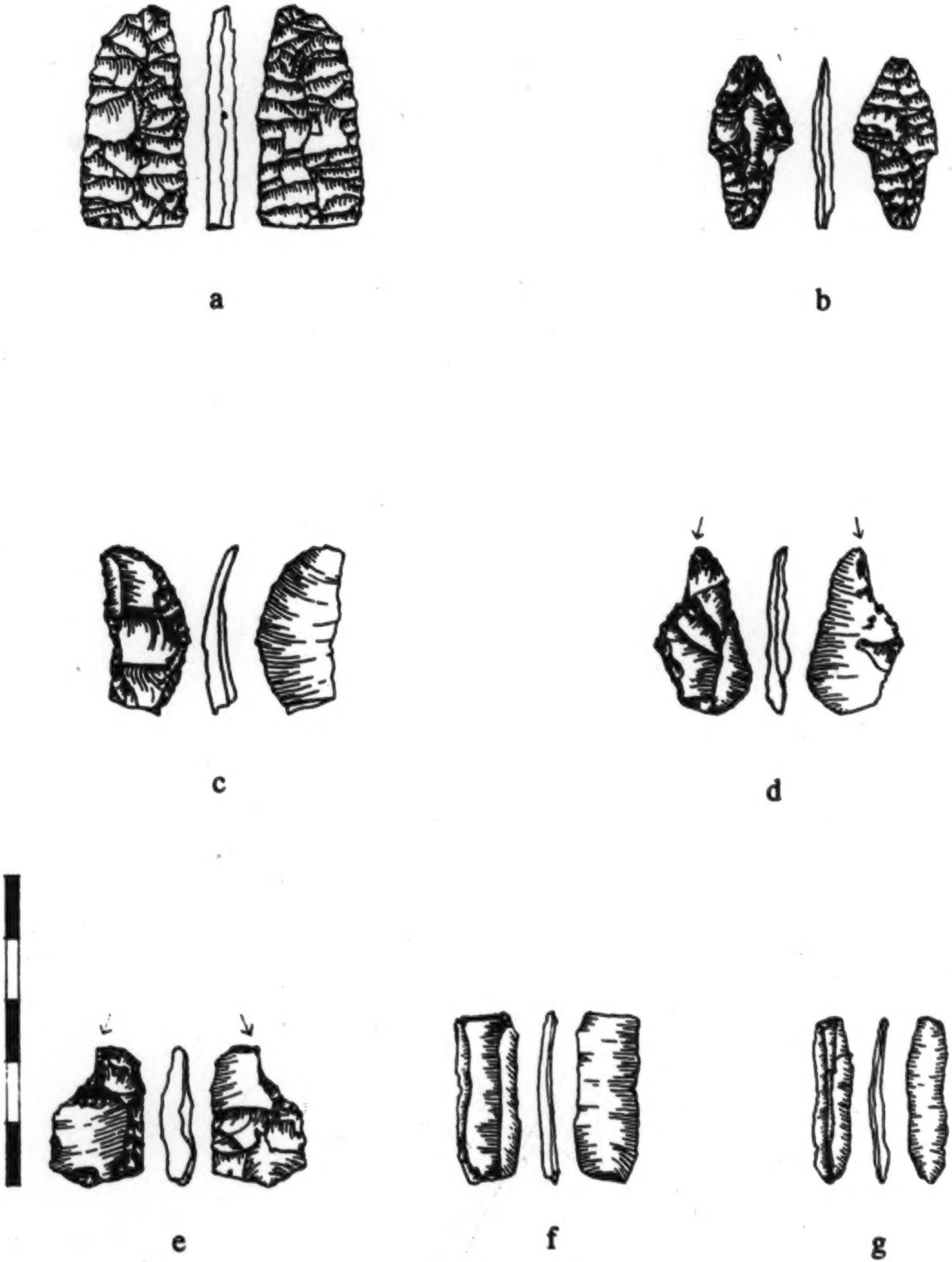
Photo 3. Pita site (KcFr-5): Facing northeast

Photo 4. Ohituk site, area A (KcFr-3A): Facing north

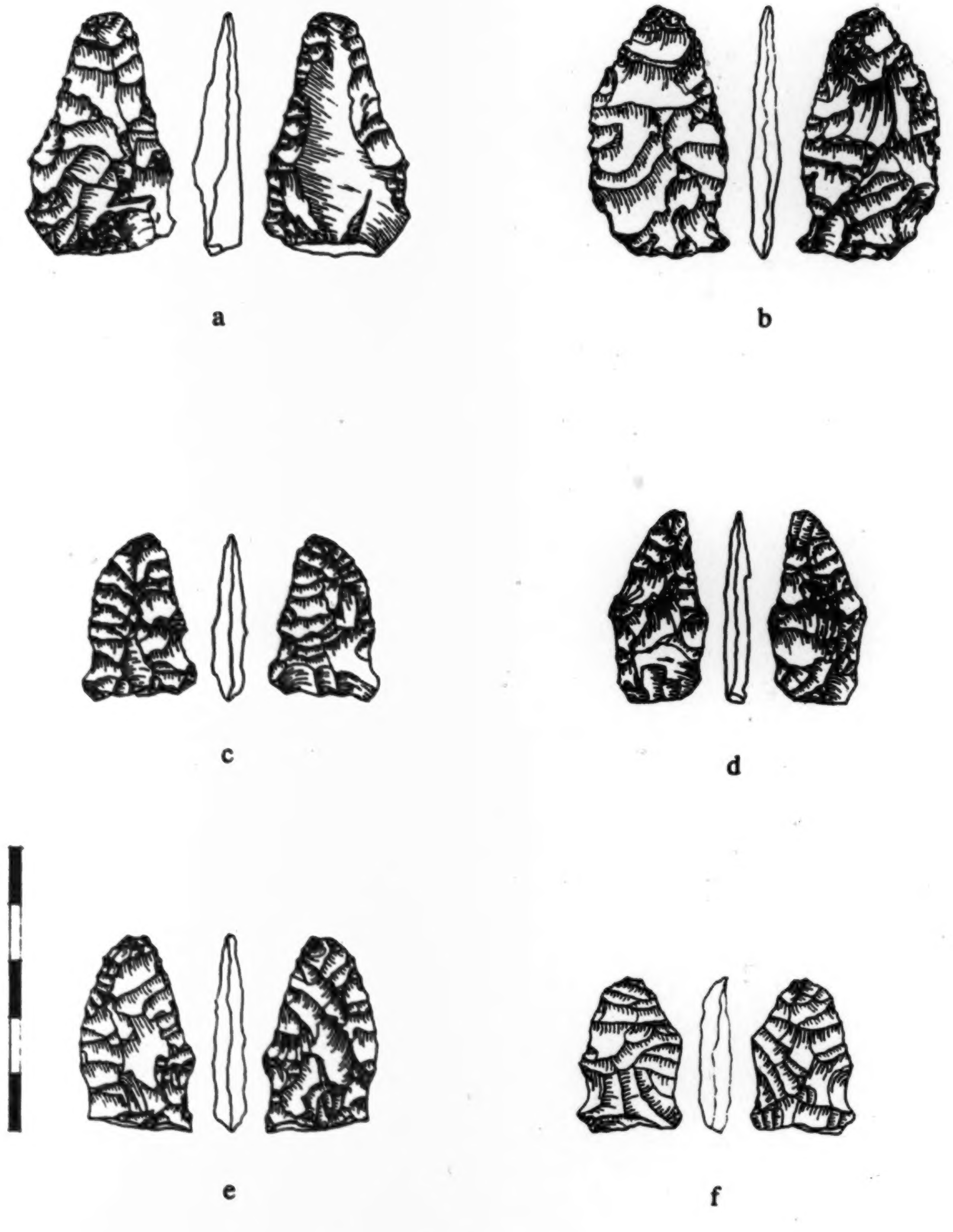
Photo 5. Tivi Paningayak site, area A (KcFr-8A): Facing northwest

APPENDIX C

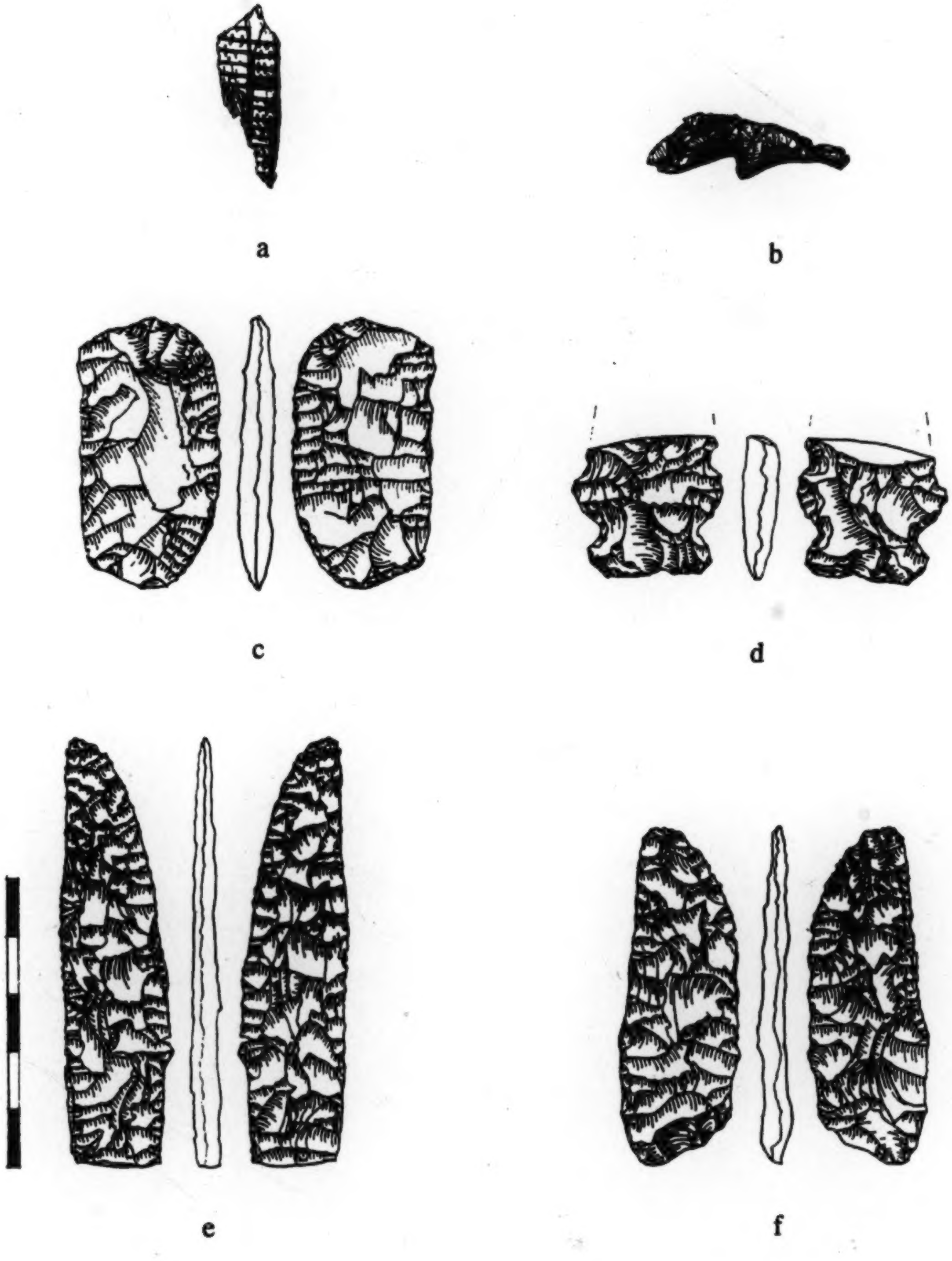
Drawings of selected artifacts from Ivujivik sites



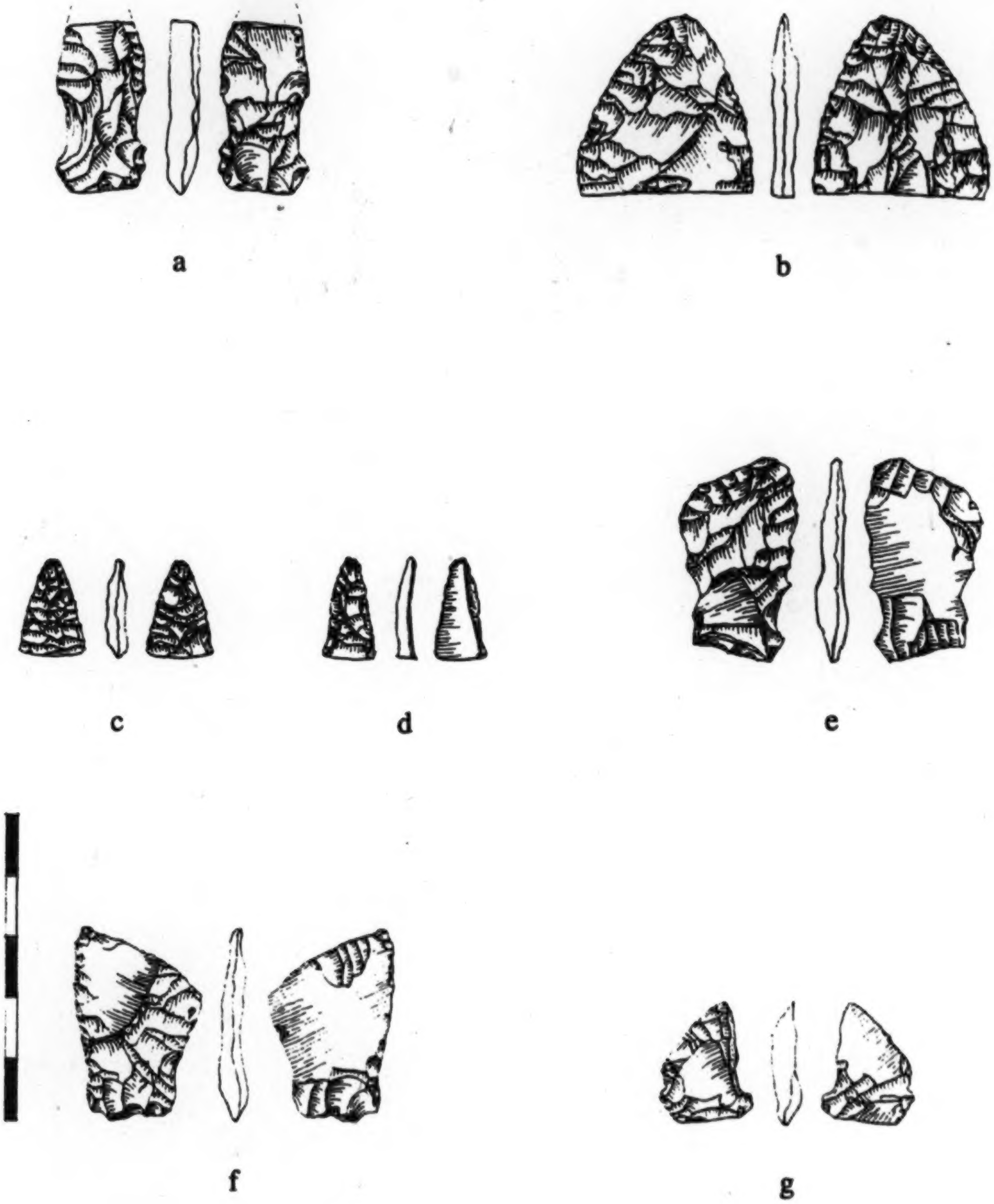
1. Tivi Paningayak site, area B (KcFr-8B): Burins (d, e), endblades (b), knives (a, c) and microblades (f, g)



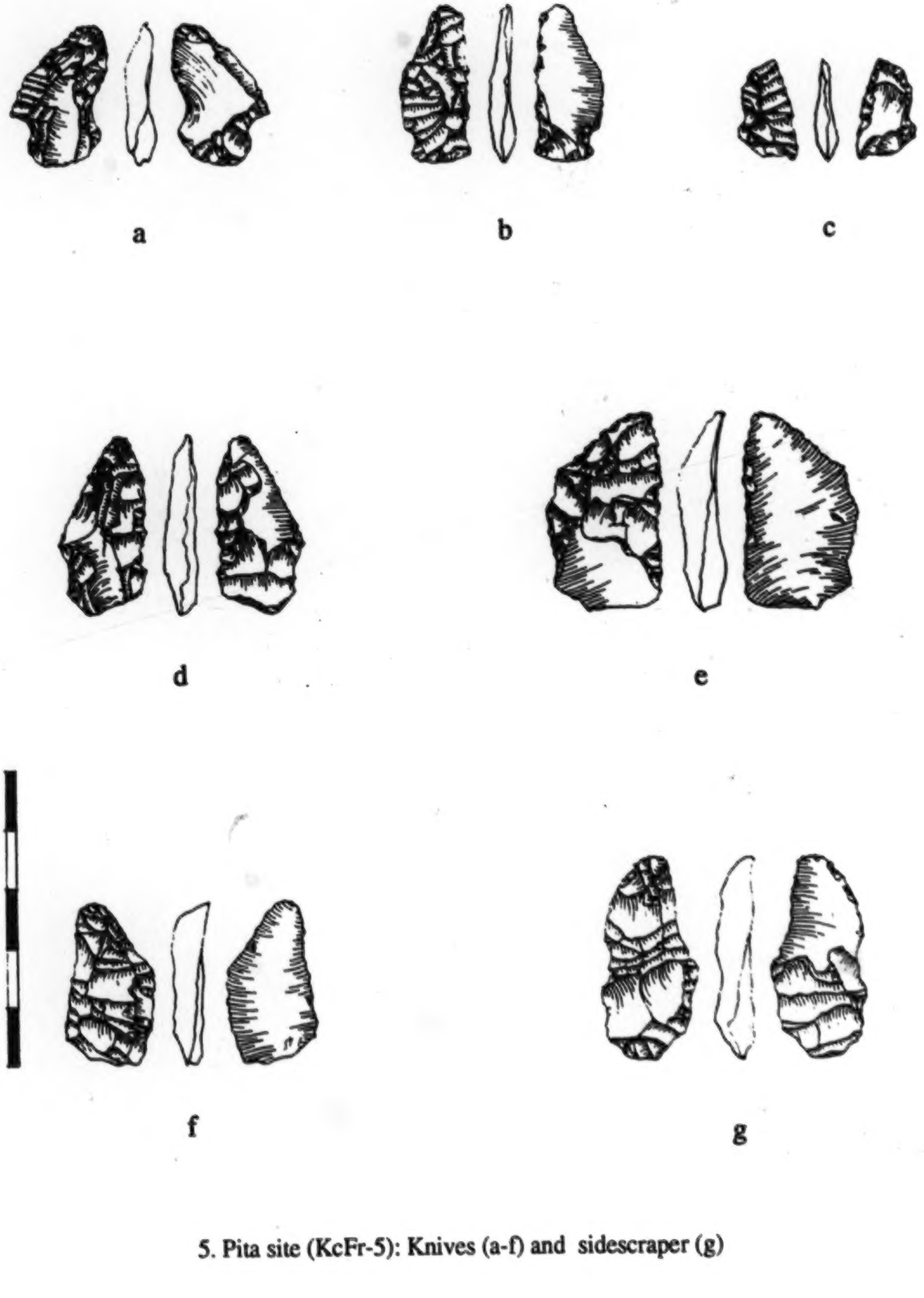
2. Pita site (KcFr-5): Knives



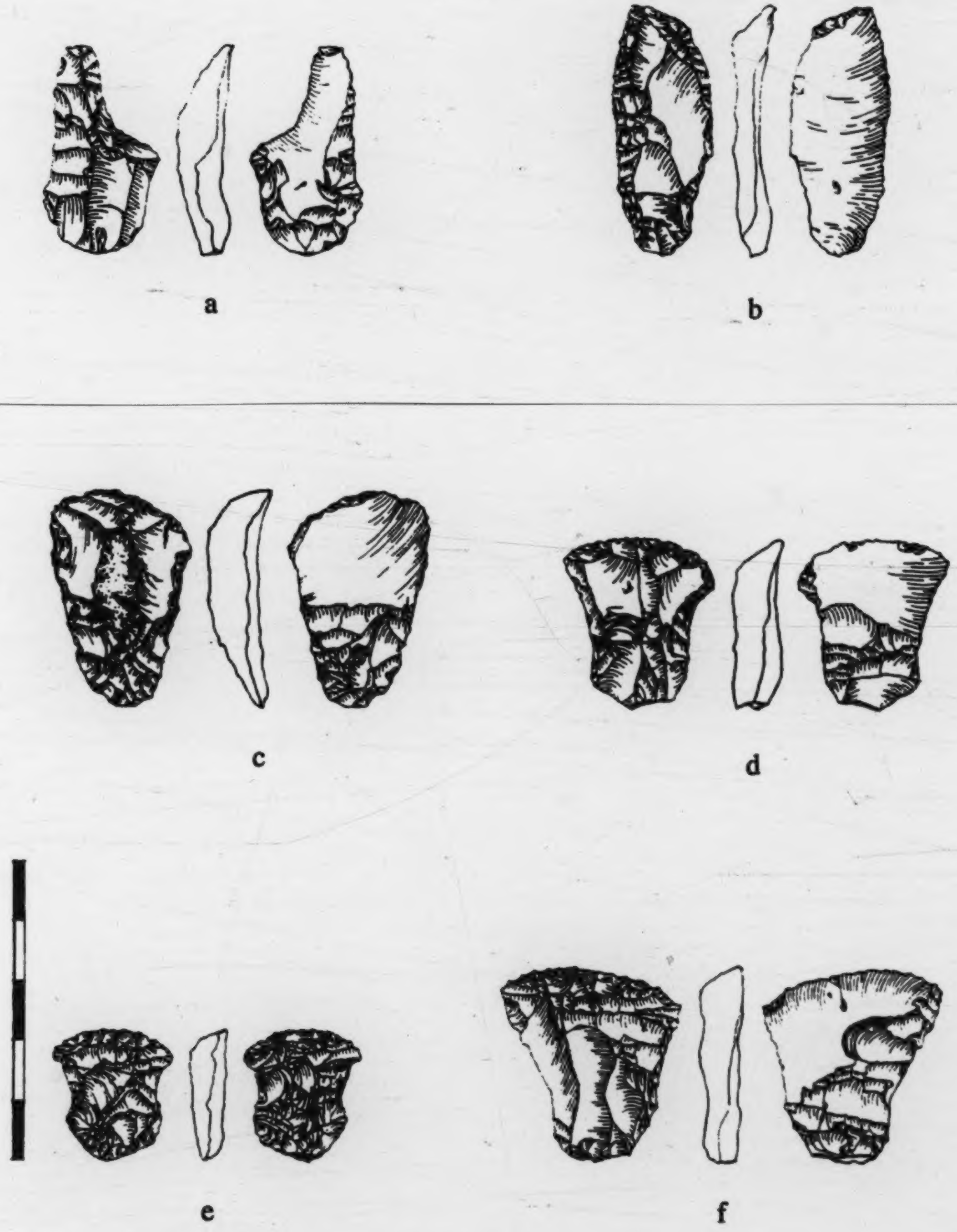
3. Pita site (KcFr-5): Bone engraved frag. (a), polar bear carving in ivory (b) and knives (c-f)



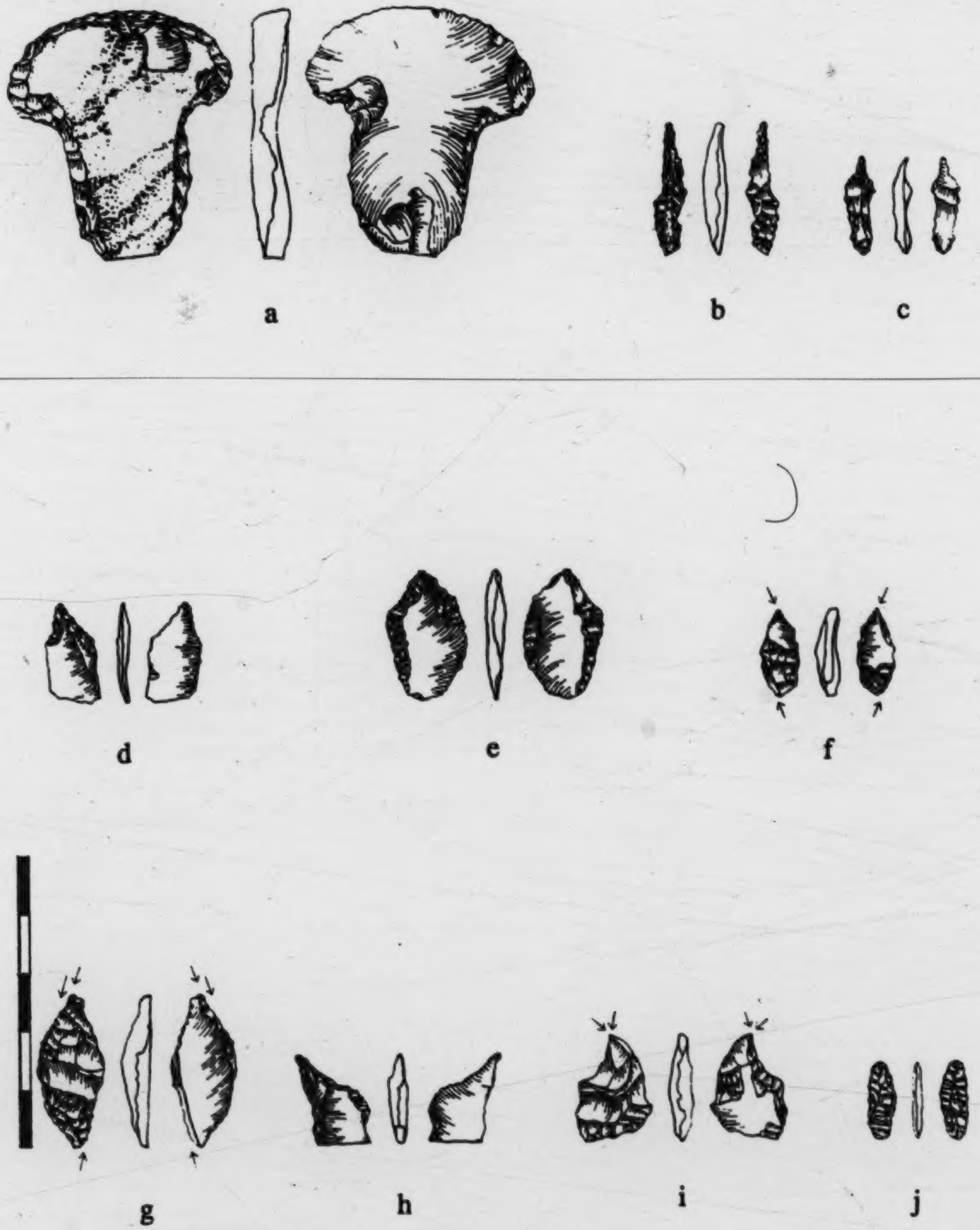
4. Pita site (KcFr-5): Endblades (c), knives (a, b, e-g) and tip-fluted spall (d)



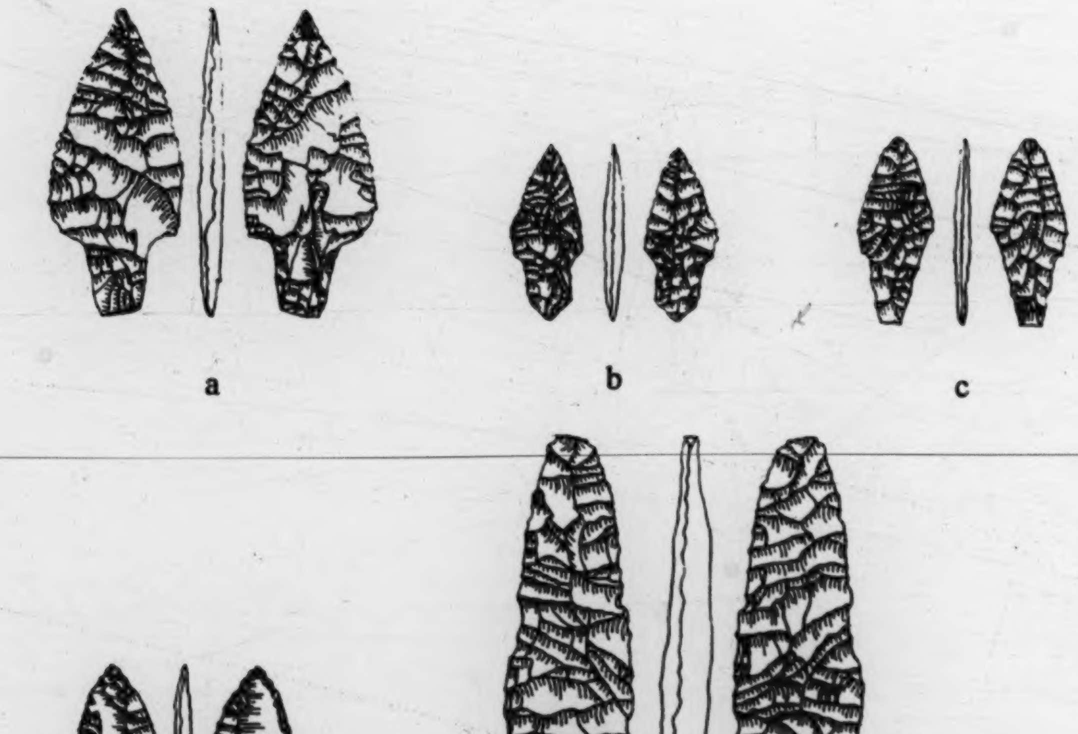
5. Pita site (KcFr-5): Knives (a-f) and sidescraper (g)



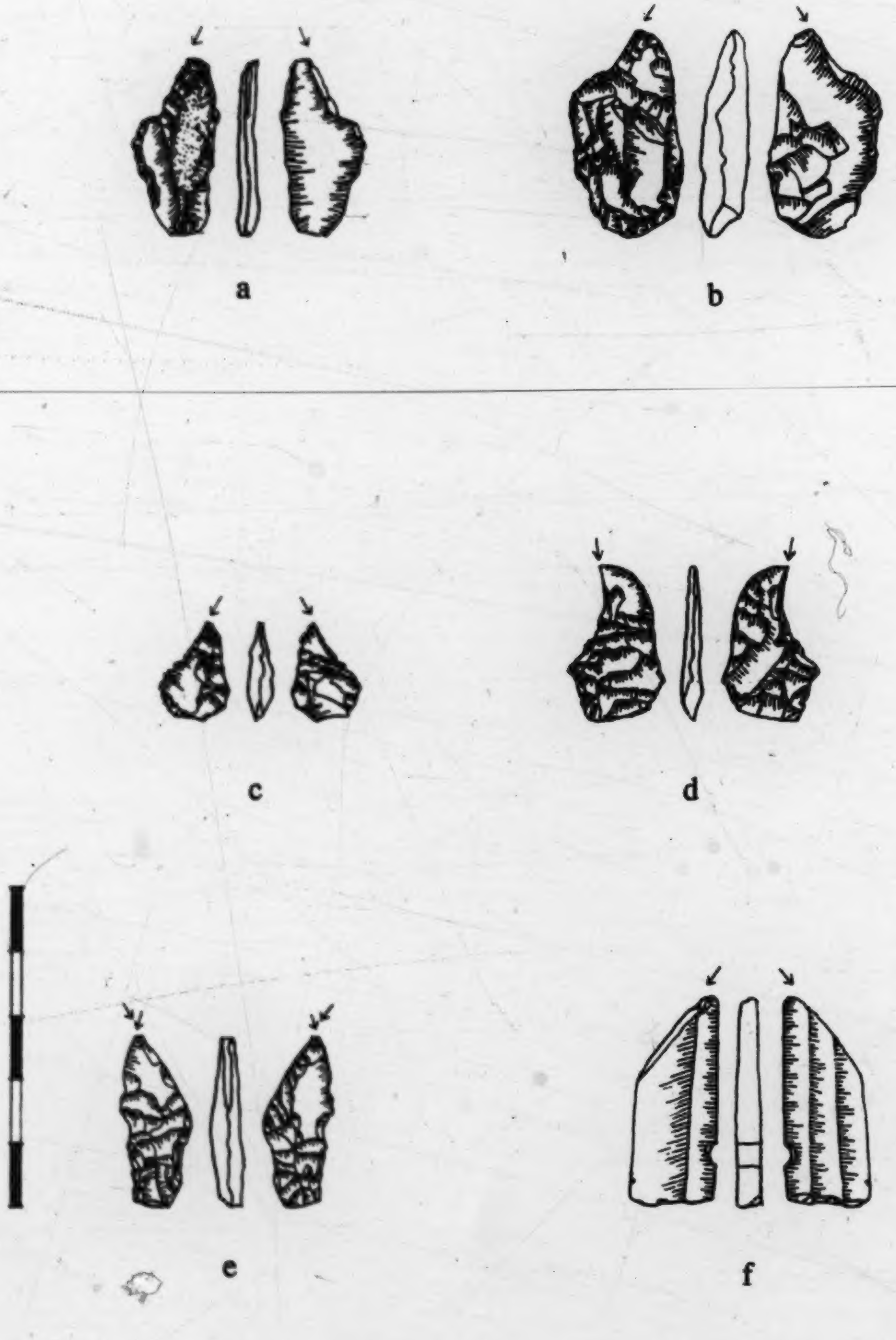
6. Pita site (KcFr-5): Endscrapers (c-f) and sidescrapers (a, b)


a
b
c
d
e
f
g
h
i
j

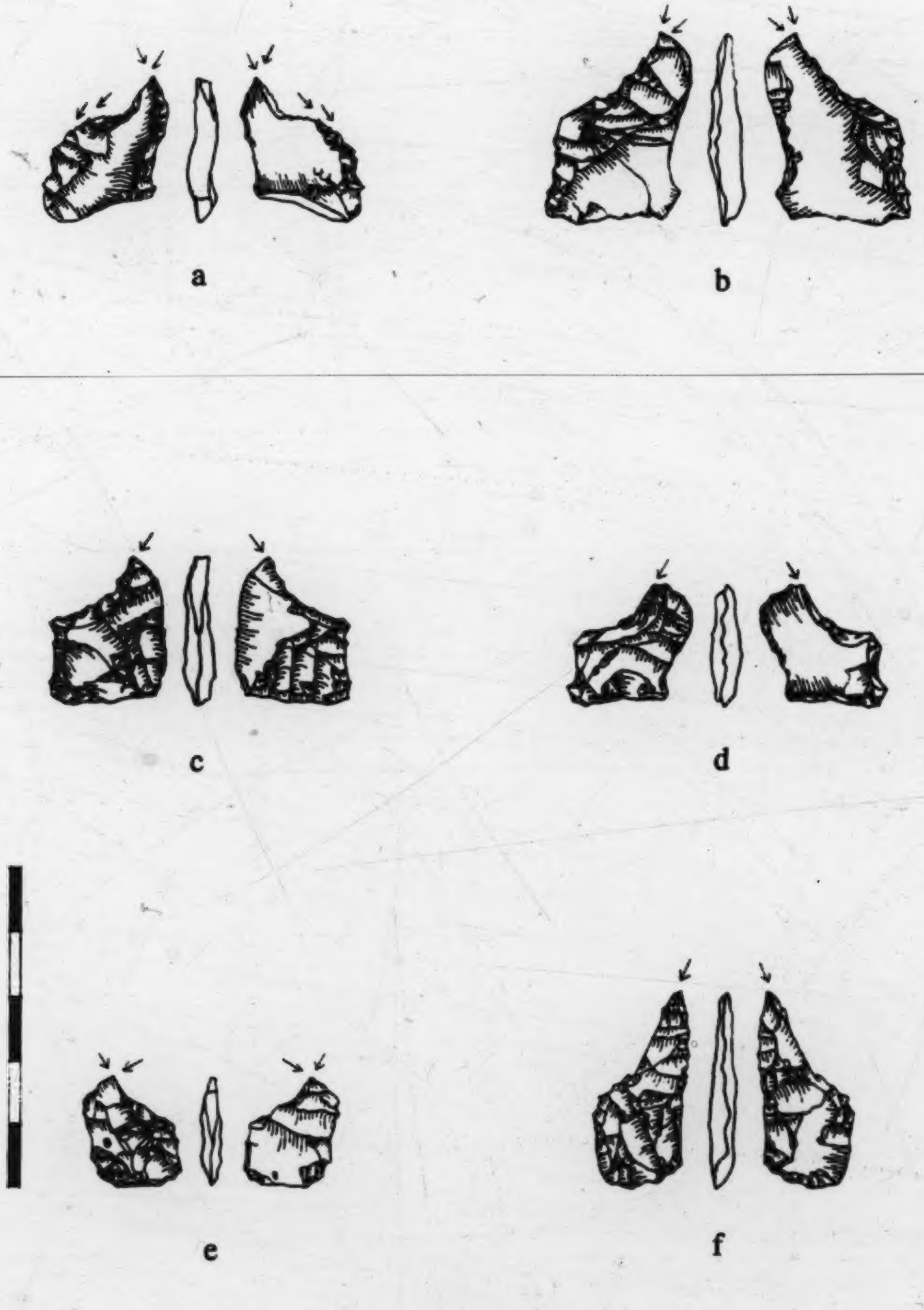
7. Pita site (KcFr-5): Endscraper (a), drills (b, j) and gravers (c-i)



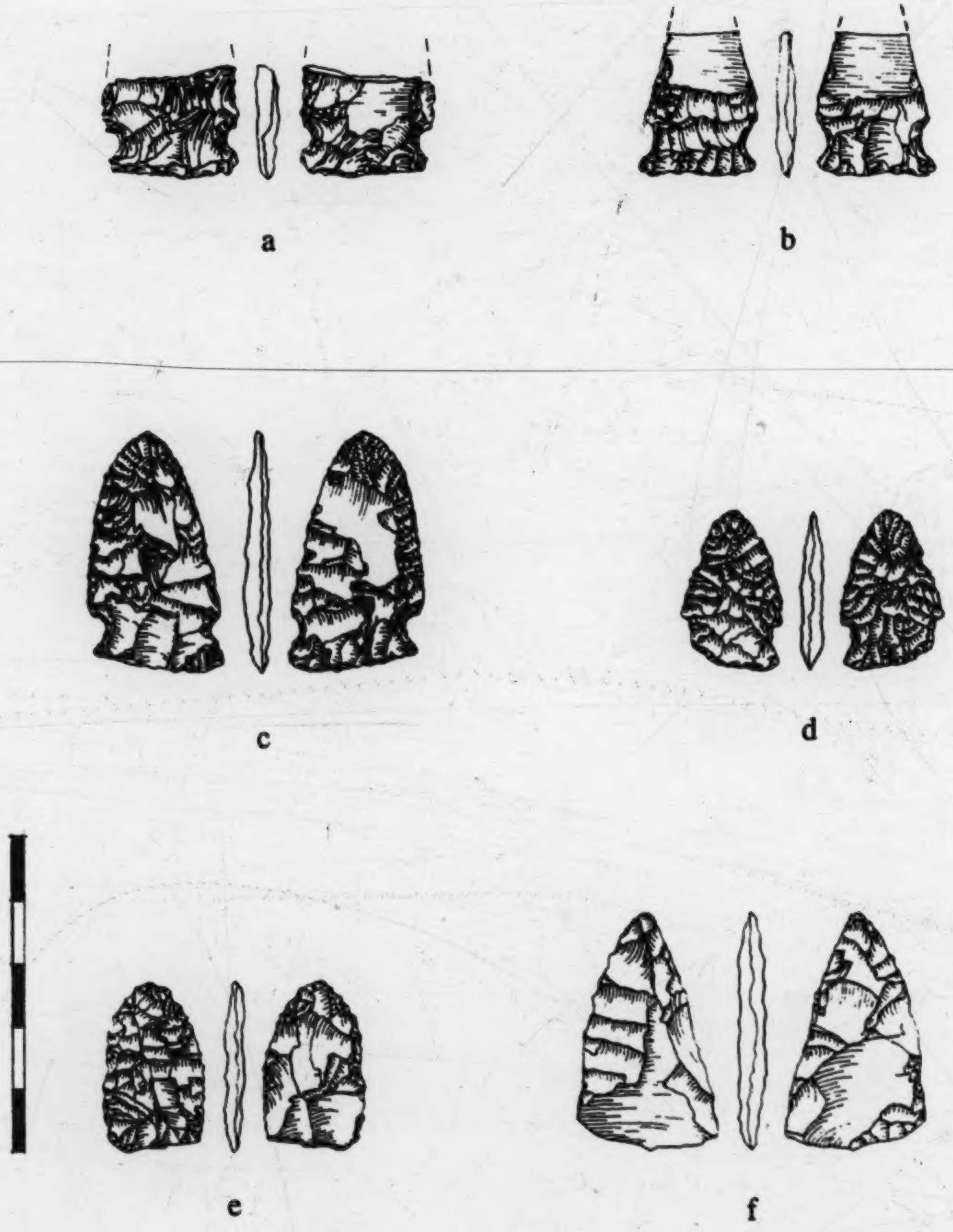
8. Pita site (KcFr-5): Endblades (a-d, f), knife (e) and sideblade (g)



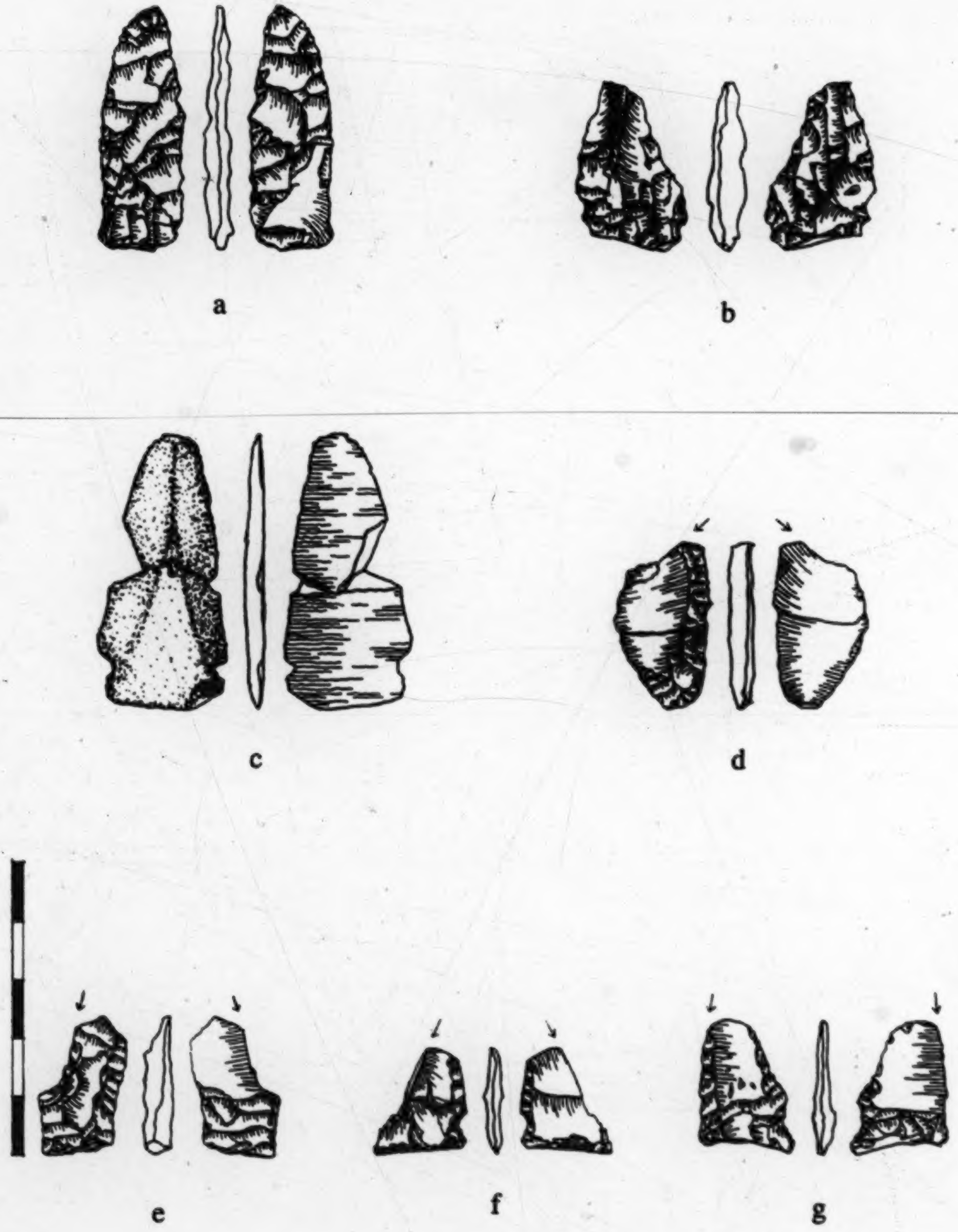
9. Pita site (KcFr-5): Burins (a-e) and burin-like tool (f)



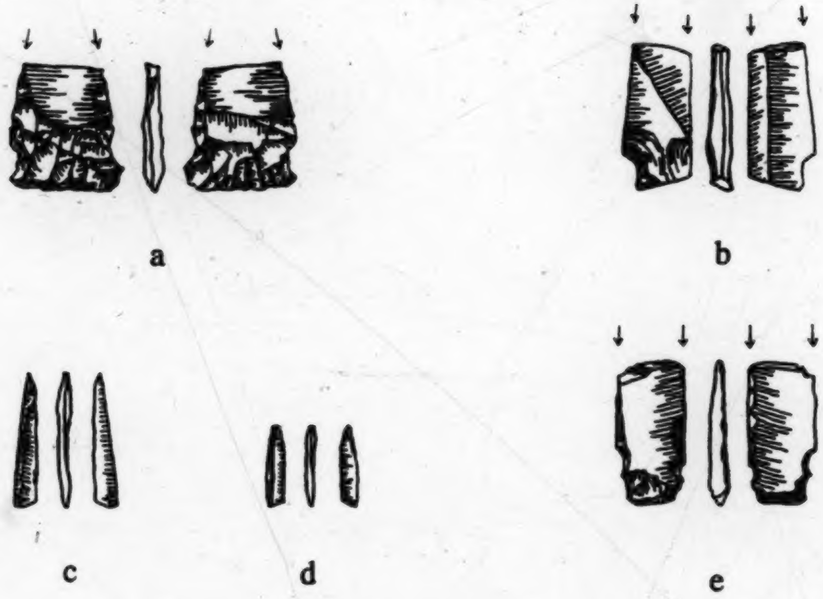
10. Pita site (KcFr-5): Burins



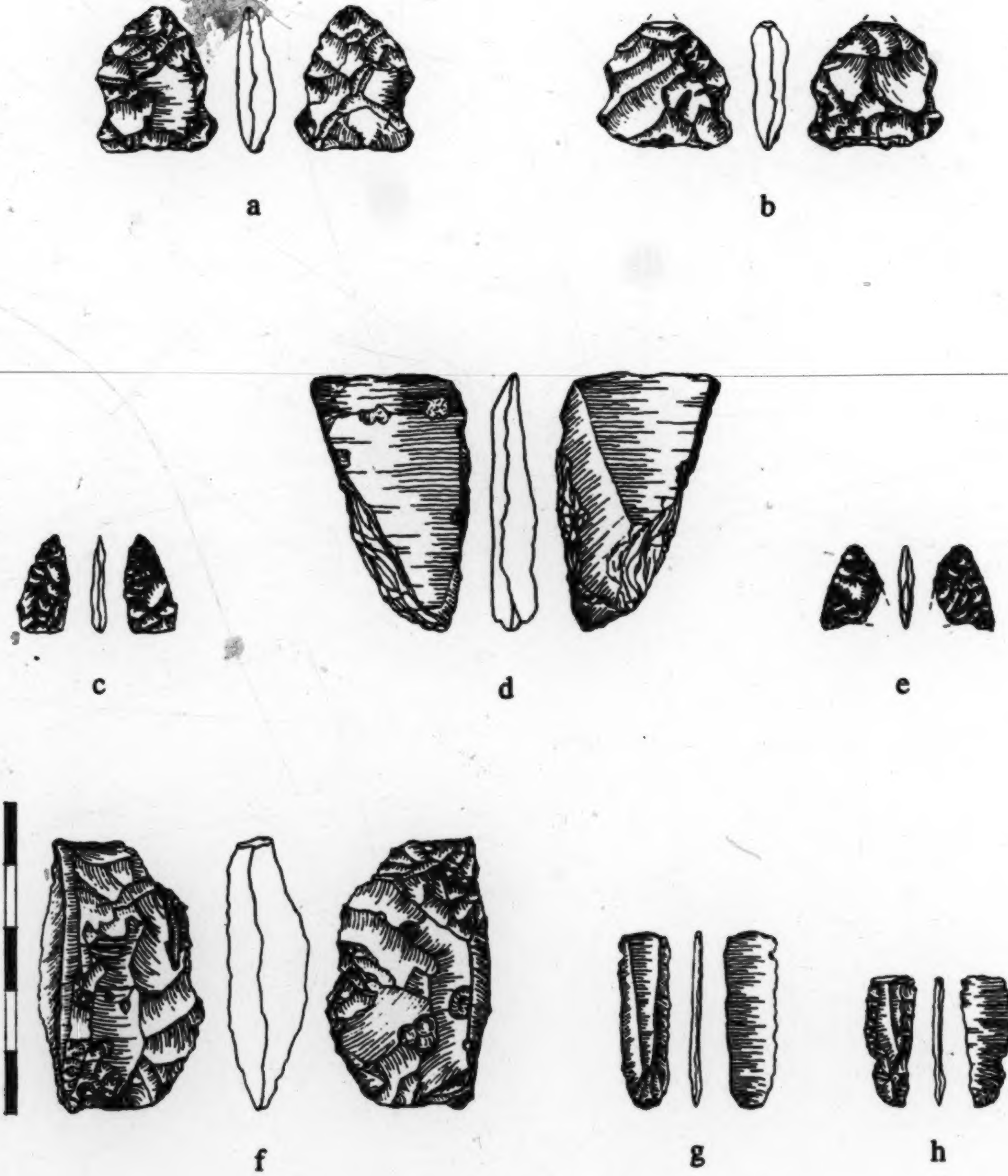
11. Ohituk site (KcFr-3A): Knives



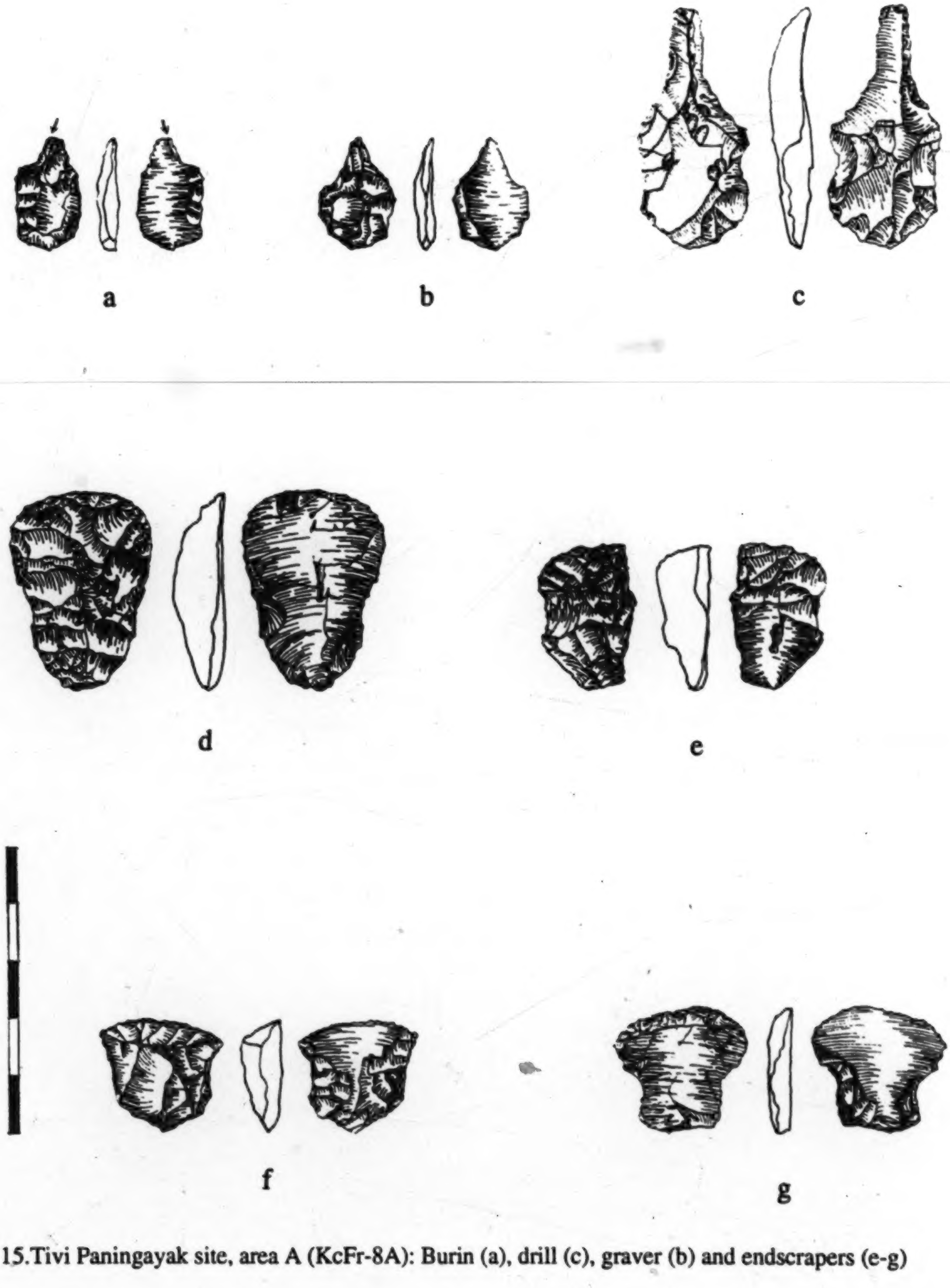
12. Ohituk site (KcFr-3A): Burins (d-g) and knives (a-c)



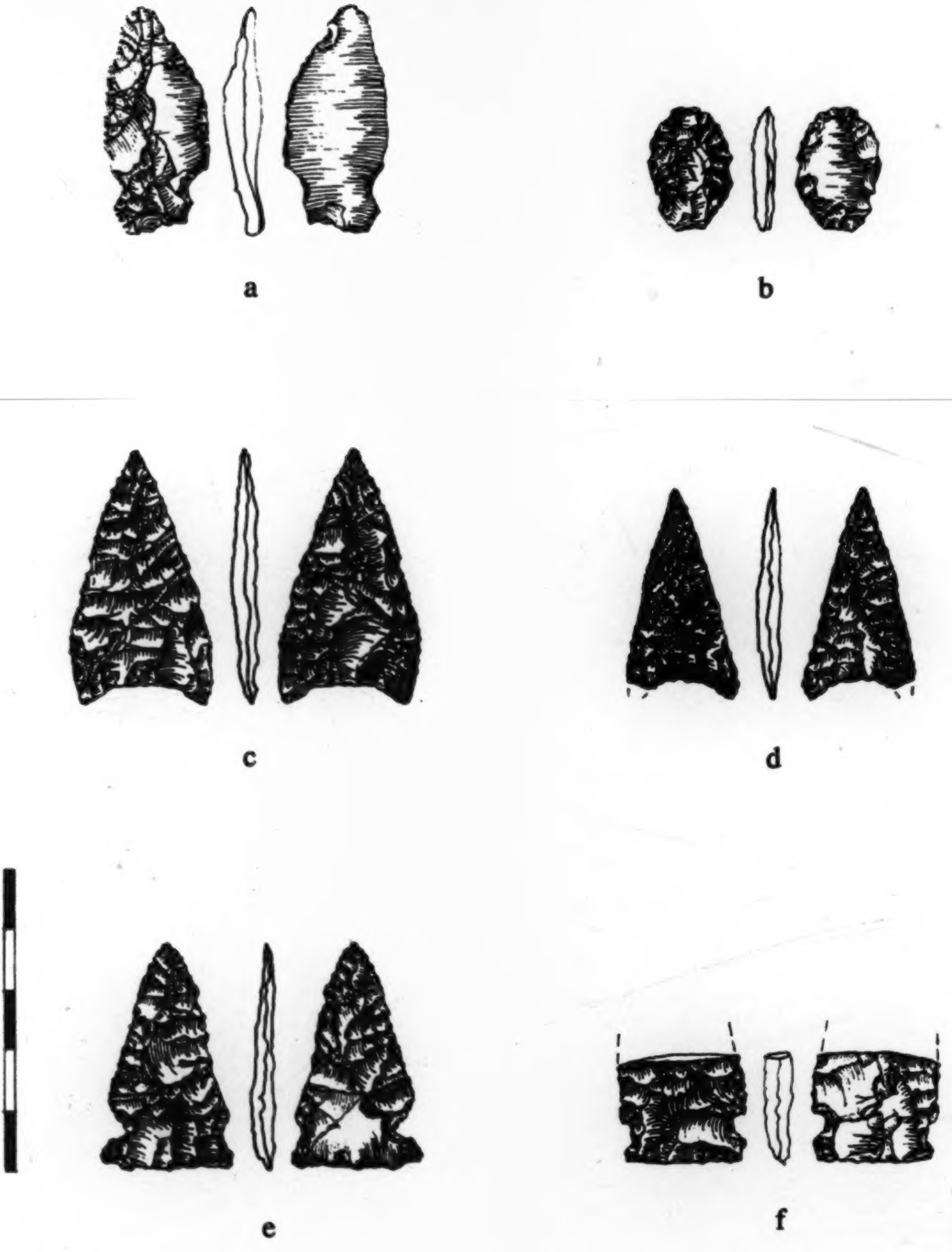
13. Ohituk site (KcFr-3A): Burin-like tools (a, b, e) and burin spalls (c, d)



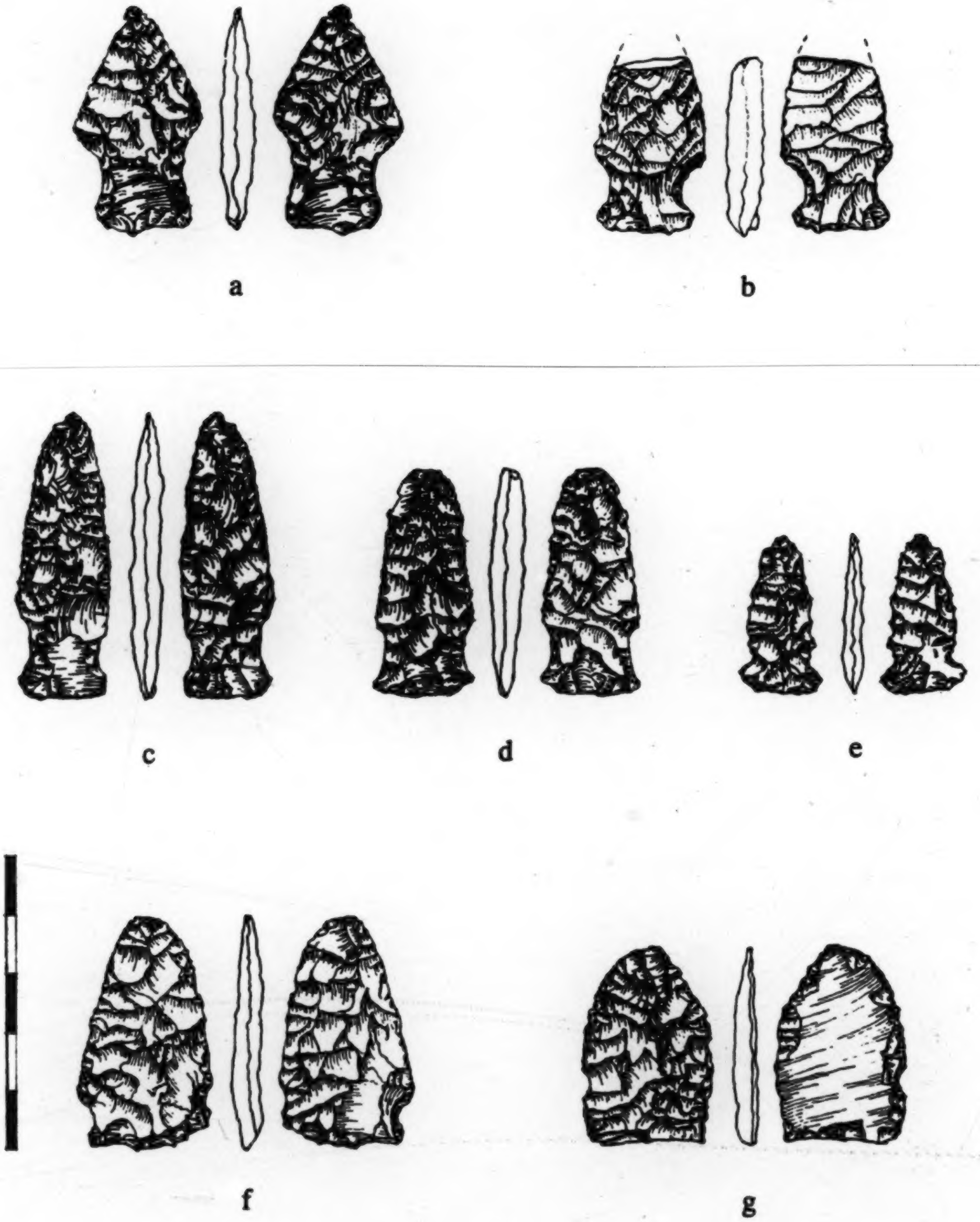
14. Tivi Paningayak site, area A (KcFr-8A): Adze (d), endblades (c, e), knives (a, b), microblade core (f) and microblades (g, h)



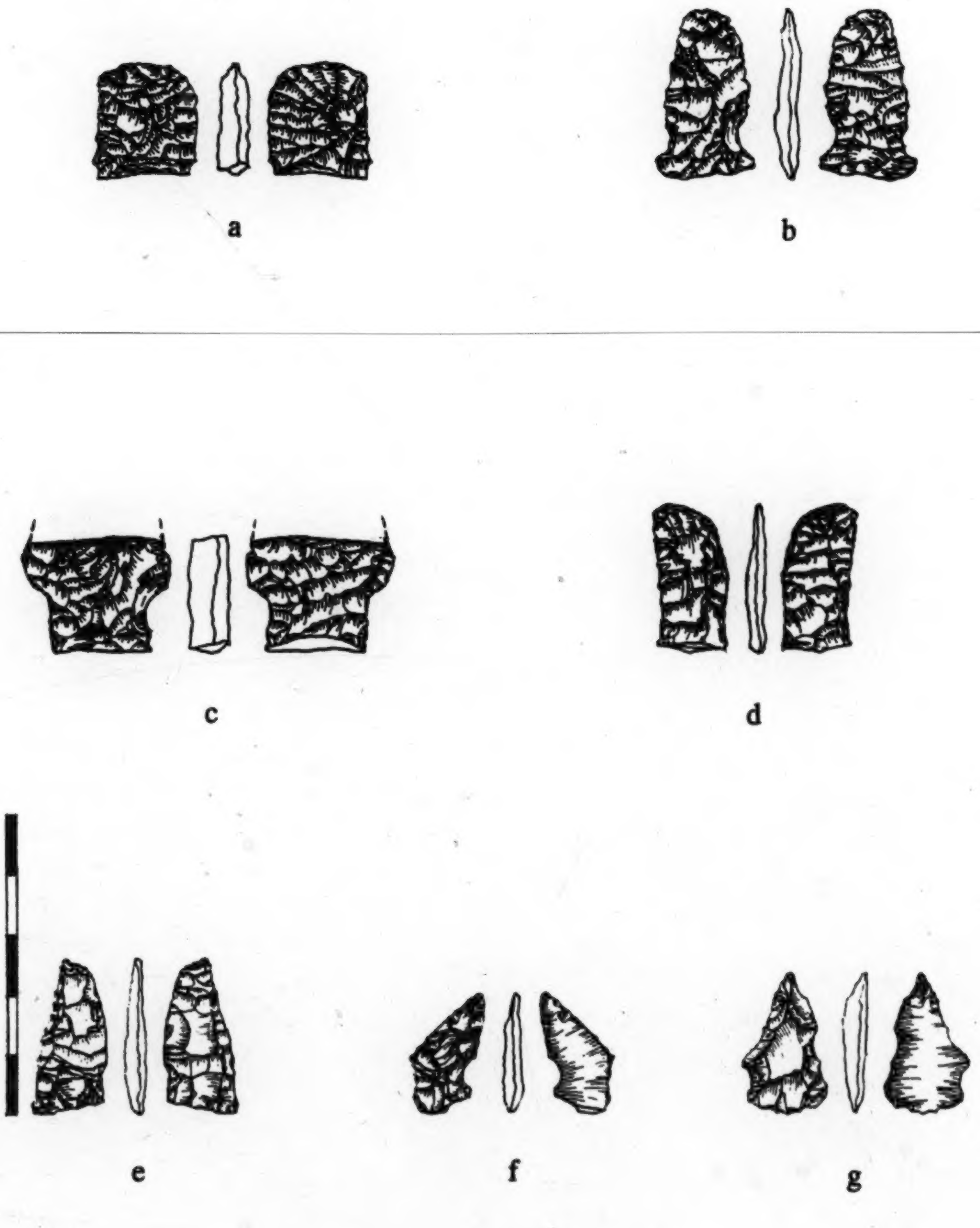
15.Tivi Paningayak site, area A (KcFr-8A): Burin (a), drill (c), graver (b) and endscrapers (e-g)



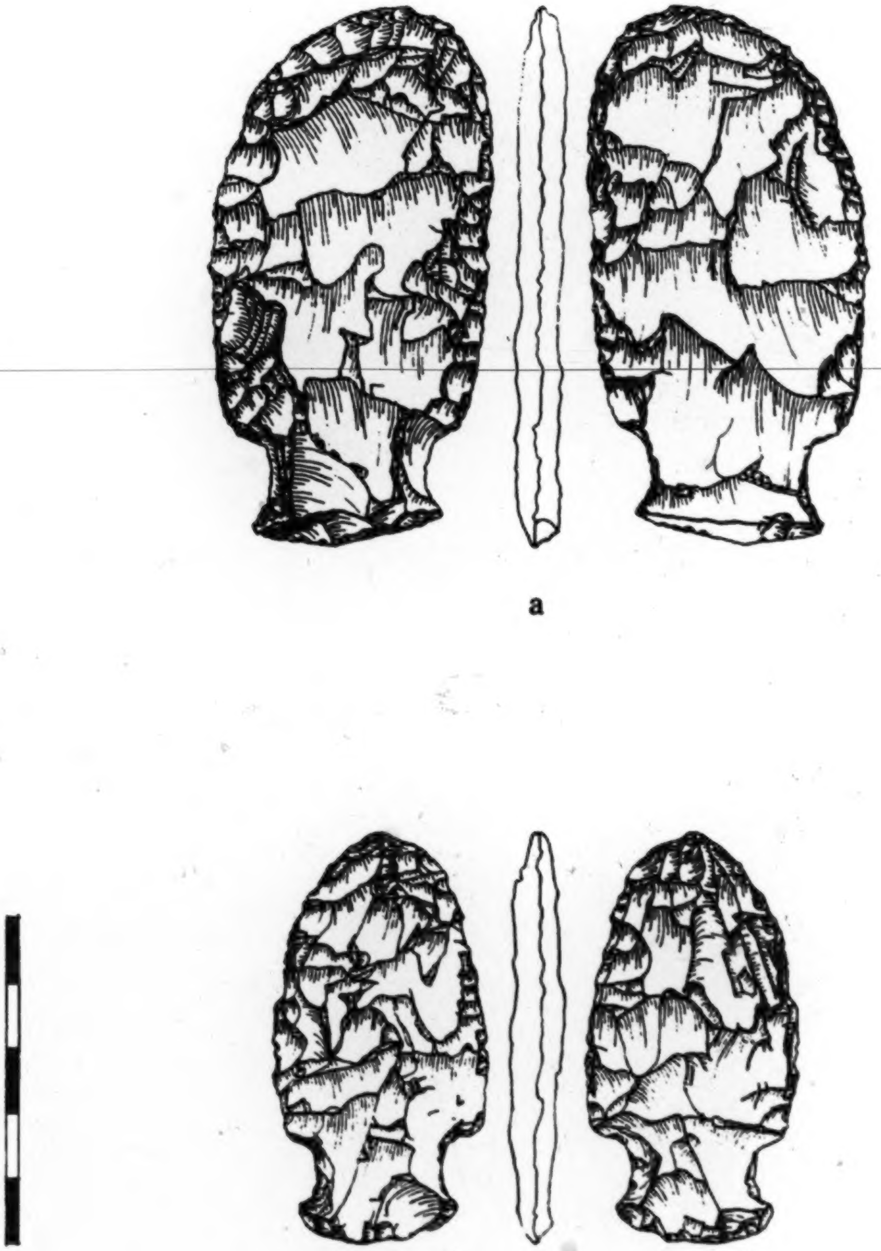
16.Tivi Paningayak site, area A (KcFr-8A): Endblades (c-f), sideblade (b) and sidescraper (a)



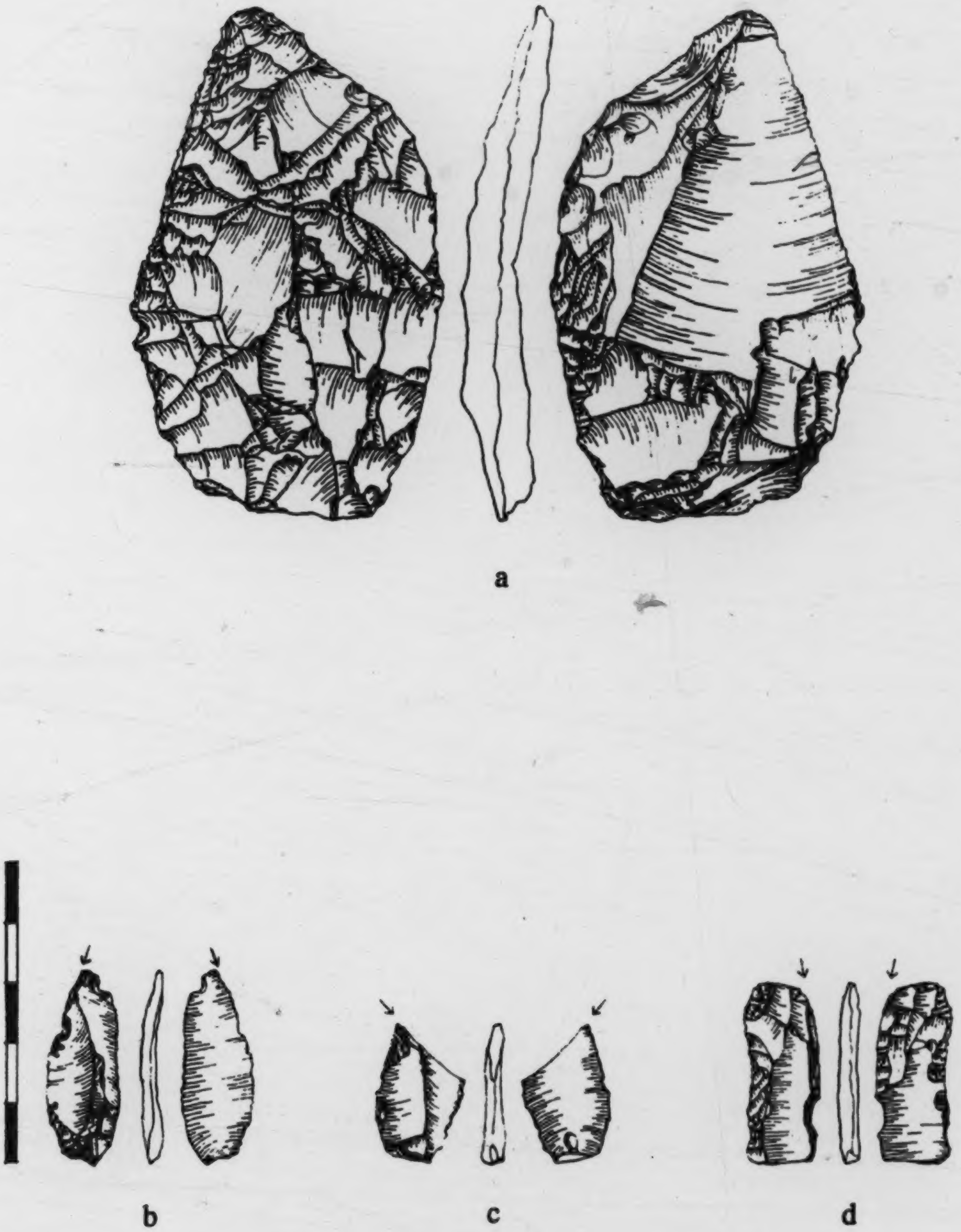
17. Tivi Paningayak site, area A (KcFr-8A): Endblades (a, b, d, e) and knives (c, f, g)



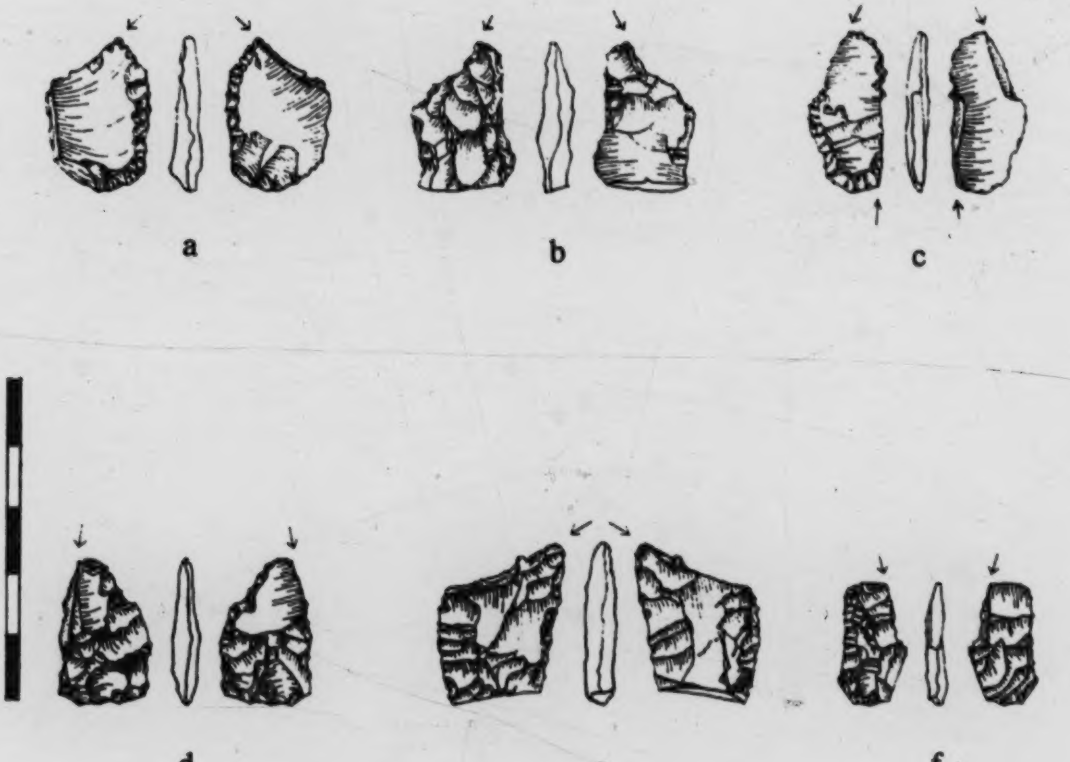
18. Tivi Paningayak site, area A (KcFr-8A): Knives



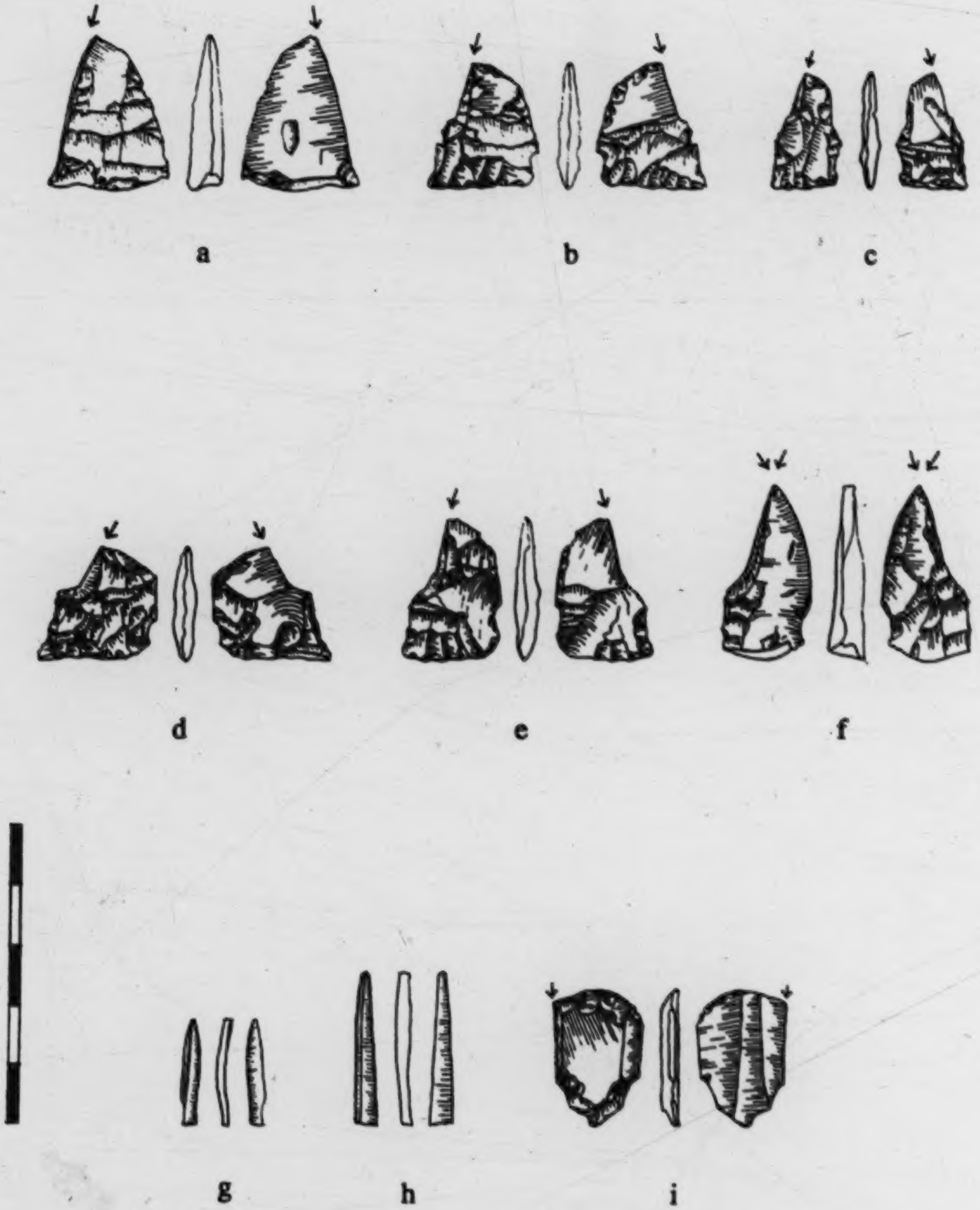
19. Tivi Paningayak site, area A (KcFr-8A): Large knives



20. Tivi Paningayak site, area A (KcFr-8A): Biface (a) and burins (b-d)



21. Tivi Paningayak site, area A (KcFr-8A): Burins



22. Tivi Paningayak site, area A (KcFr-8A): Burins (a-f), burin-like tool (i), and burin spalls (g, h)